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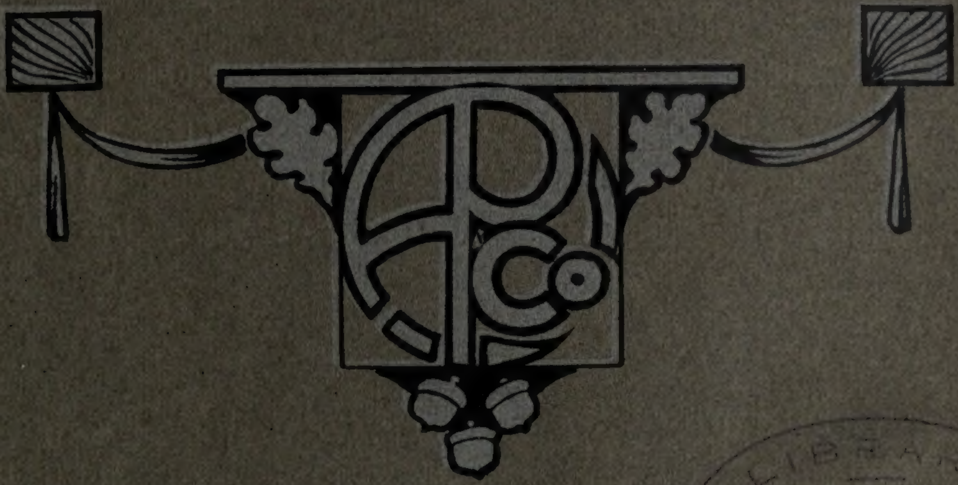

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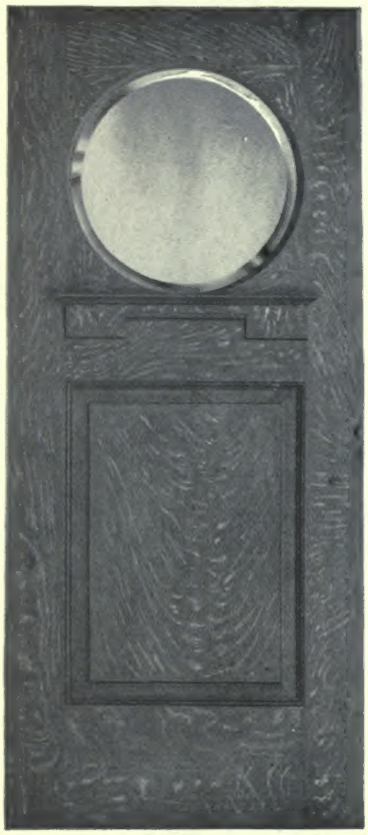

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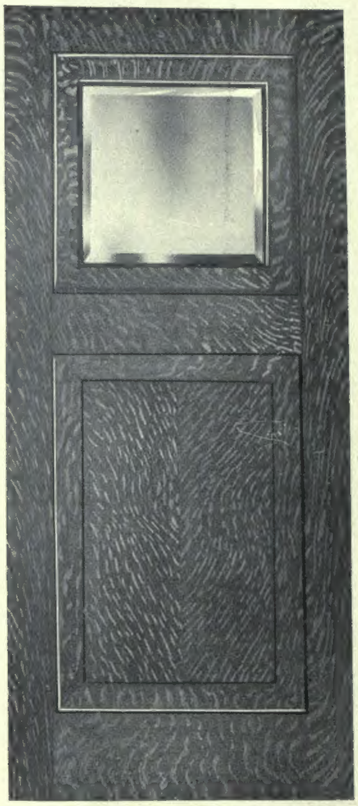

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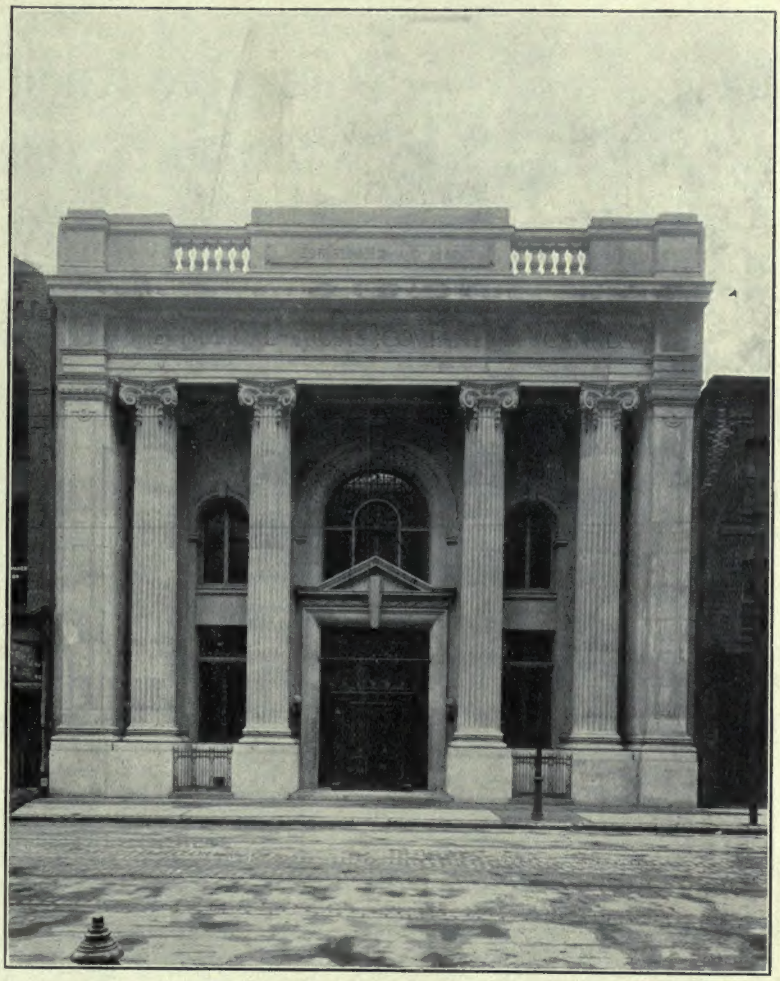

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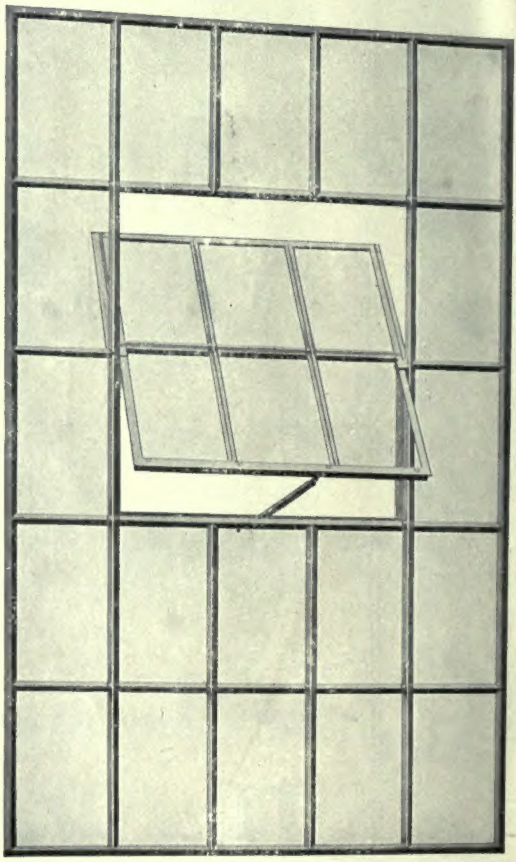

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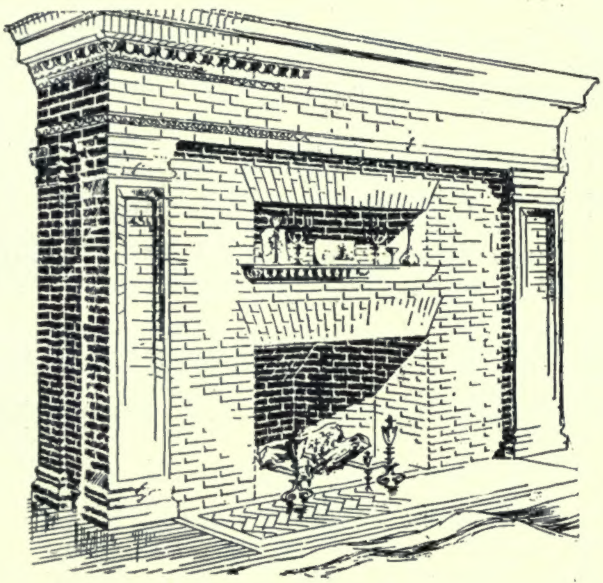

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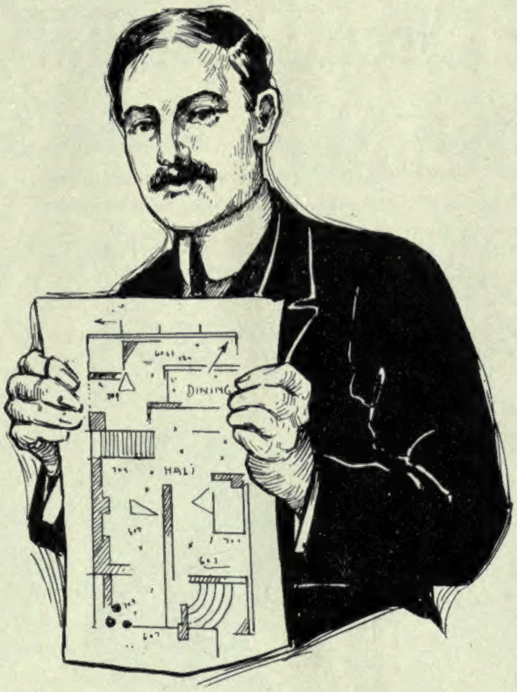

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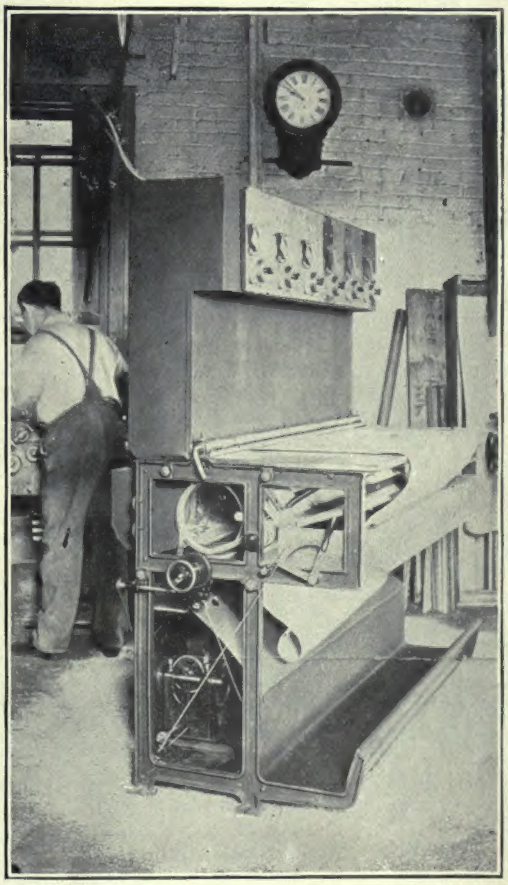

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F. J. TYNER

Tyner has been assigned to Manitoba and Saskatchewan. Merchants in these provinces will find him full of enthusiasm over The Builder and Contractor and the service it will give its readers.

G. A. TALBOT

Talbot works in Eastern Ontario. He'll be thoroughly in earnest when he tells the merchants in his territory that they can't be happy without The Builder and Contractor.

H. KAVANAGH

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L. H. DRAKE

Drake is covering Western Ontario. You can tell at a glance that he is an optimist by nature, and he assures us he never felt more optimistic about anything than he does over The Builder and Contractor.

F. PANG

Pang looks serious, and so he is. He believes publishing a trade paper is a serious business. At that rate he won't find it difficult to maintain his enthusiasm over The Builder and Contractor and he will try to impart some of it to the trade in the Maritime Provinces.

In addition to Messrs Moody and Tyner, J. W. Miller has also been assigned to the Western Provinces.

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A Journal Devoted to the Interests of the
BUILDERS OF HOMES
PUBLISHED ON 15th OF EACH MONTH
For Contents See Page 181

K. A. MACKENZIE, B.A.Sc., MAN. EDITOR
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British Trade Commissioner's Report

It is gratifying to have the optimistic views of the conservative British Trade Commissioner in Canada, Mr. Grigg, respecting the outlook in the Dominion. He has studied the situation here for many years and has won respect throughout the country by his courteous attention both to British and Canadian inquiries, and by his extraordinary grasp of conditions in Great Britain, Canada, and the United States. Another indication of the good work being accomplished by the Commissioner, who is resident at Montreal, is the publication of an unusually interesting bluebook by the Imperial Government. The pages are from the pen of Commissioner Grigg, who notes that the Canadian market as a field for present and future British trade, is governed by certain conditions, which give to the economic life of the Dominion a character of its own. Canada has for a decade past been undergoing, and seems destined to undergo for a considerable period a great industrial and financial expansion. This phenomenon is not comparable to the mere alternation of good times and bad, of inflation and restriction, the periodicity of which has been for generations past a commonplace of economic discussion. An expanded market due to the incidental occurrence of "good times" is often a cause rather of apprehension than of confidence to the manufacturer and trader, as it suggests rapid gains and the utilization of the present without counting upon the future. The trader makes hay while the sun shines, well aware than an overcast and clouded sky may at any moment check his activities. Present opportunities he utilizes to the full, but anything in the shape of larger capital expenditure, of patient preparation for the future, of immediate sacrifice for later gains, he is disposed to regard with the utmost caution. In Canada the case is different; expansion is not an incident, but rather a permanent condition of economic life, the existence of which, in the interests of the British trader, cannot be too highly emphasized. It is true that in the general movement of the industrial progress of the Dominion the same oscillation of good and bad years is to be observed as elsewhere; the progress of the country, for instance, industrially, and in the growth of its population, during the decade 1881-1891, was by no means rapid, and the development of Canada was held in check by the extraordinary industrial expansion of the United States, and by the large area of fertile land still open for settlement in the American West, but it was inevitable that sooner or later the resources of the country would attract the population and capital necessary to its development. The reasons, therefore, for the present expansion are obvious.

The Canadian builder and contractor can gather from these words an idea of the work which stands ahead. Commissioner Grigg's chapter on immigration to Canada shows that there will be no lack in the demand for homes during coming years.

Importance of Cost Analysis in Construction

In these days of keen competition when the margin between profit and loss is so narrow that a slight error in estimating is apt to throw the balance on the wrong side of the ledger, it becomes more and more evident that more careful consideration must be given both questions of cost keeping and cost analysis. In large manufacturing businesses and stores this has been reduced to a very fine science, but in building and contracting much more could be desired. All grades of builders and contractors are interested. It is surprising, however, to contemplate the "know it all" attitude of the "smaller" men. They, as a rule, stick to one particular line. And yet in this they can rarely give definite analysis of costs. Their ambitions rarely tempt them to strive for bigger jobs. It is well so, for the lack of the power of analysis would not let them take the forward step.

The American Society of Engineering Contractors—a society which has a considerable membership in Canada—is doing a most valuable work in developing a uniform system of cost analysis in construction work.

Their General Committee on Uniform System of Cost

Analysis, under the chairmanship of DeW. V. Moore, brought in a progress report along the following lines.

Any broad comprehensive system of cost keeping will, no doubt, contain certain elements of cost analysis, and on the other hand, cost analysis being based upon the same comprehensive system of cost keeping as a foundation for any results secured, must necessarily embody suggestions along the line of proper cost keeping.

Naturally, in individual work, minor changes may be applicable and individual ideas incorporated, but in general any uniform system of cost analysis can only be obtained by the working out of a standard method of distribution, so that when one job is analyzed and compared with another, and where possibly the individual making the analysis has no familiarity with either or only one, there may be a direct method of comparison and analysis.

Even minor changes, due to the personal ideas of the individual, will throw any such comparison of analysis out of balance with the work of those who are following such a system. Many individual preferences may have good reason for existence, and it is only by receiving the suggestions of all and thoroughly discussing each and every classification and distribution, that there can possibly be any advance along this line.

The same thing may be said of the uniform system of cost keeping. Cost keeping, even when conducted along as nearly uniform lines as possible, must necessarily vary in the form of blanks used, and the amount of clerical labor involved, all of which depends on the character and extent of the work.

They suggest that a well-understood definition of cost analysis be adopted in order that there may be a clear understanding and as little confusion as possible.

First: "Cost analysis is that executive mapping out of new work; supervision of such work, and compilation of the records secured through cost keeping in order to secure comparative values." Second: "Cost analysis is the study of the data obtained by cost keeping whereby the reasons for the results are determined." Third: "Cost analysis is the executive department of contract work for the purpose of proper supervision and securing of intelligent records, whereby experience is fortified for future reference." We are not entirely satisfied with any of these definitions.

"Cost keeping, even if this society is successful to a certain extent in standardizing same, must contemplate the preparation of forms or blanks whereby distribution of the pay roll and material, etc., is properly made to the various accounts, but as it also contemplates the utilization, generally, of only ordinary clerical help, and in the majority of cases, under the most adverse conditions, no particularly intelligent idea is to be expected from such records unless the executive head maps out the work to be done, to a degree far beyond mere forms for separation of items."

Cost keeping—as an illustration in "concrete work"—is "concrete work" to the cost keeping man, regardless of the character of the work; how it is done, where it is done, the time of the year or a hundred other conditions which may make the reports misleading. Many advocate that by adding a complete description of the work, this difficulty is overcome. This, to a certain extent, is true, but if the description is made long enough to be of any particular value, it makes the cost records cumbersome and of little use to the average busy man.

It seems that there is within each and every job, no matter how done, where done, even if under abnormal conditions, that there is a method of so dividing and sub-dividing the contract work that even jobs of entirely different character can be compared on the same items of work elsewhere, or, in other words, the information becomes directly available, provided, always it is understood that a standard method must be used.

Cost analysis is not concerned with what work costs, but is concerned in ascertaining why it costs as much as it did, and whether it is above or below the average, and if so, why? Cost keeping states certain absolute facts as being such because they are records. Cost analysis goes one step further and states why the work cost a certain sum, and what could be reasonably expected under different circumstances. Cost analysis begins at the time estimates on new work are prepared, superintends the adoption of a cost-keeping system in harmony with estimate, watches the work during progress for any and all abnormal conditions, segregating same and finally analyzes the records.

In order to successfully carry out the idea of cost analysis, cost keeping itself is effected by the character of the records required. Unless in securing the cost records, all specials are recognized and so recorded with reference to any particular job, thereby leaving certain standard elements which enter into all work, the cost keeping record will be so confused that it will be impossible to make any analysis. This means that before the job is actually started the estimate and plans be studied and special distributions provided for any class of work which is peculiar to the particular job, and that also during the progress of the work subdivisions where special peculiarities arise during construction are properly recognized in the records.

Cost analysis should simplify, rather than complicate cost keeping. Cost keeping may be carried to the extreme in any one general division of the work. It may be subdivided to such an extent that it is almost impossible within the limits of the ordinary clerical force to keep the work up, day by day, and such an elaboration of divisions produces misleading distributions and records. The society does not contemplate any such method. In fact, it does not contemplate to any very large extent, the sub-division of any general character of work except under special circumstances. If the specials, peculiarities, and non-esentials of any job are recognized and carried under special headings, then all the remainder being the standard divisions of work, may be carried such.

As an illustration, in concrete work we are not interested in knowing what it cost to drive nails and draw nails, or to saw off boards; nor to carry the point a step further, are we interested in knowing what it cost to wreck forms.

If we have sufficient information that we know what the forms cost to make the first time, then knowing the cost of the form work for the entire job, and the information as to the number of times the forms are used, we have all the information that we need for the purpose of future estimates and comparisons, providing that if there is any special form of construction, it has its own unit distribution.

Revision of Building Cy-Laws

A number of Canadian cities are at present wrestling with the problem of the revision of their building by-laws. In other cities agitation is going on along these lines. In most cases the criticism of the present codes are most reasonable and obvious: in others, diverse opinions are often expressed by different interests, of the same portions of the by-law.

The importance of fair, up-to-date, building by-laws cannot be over-estimated. Too often the preparation of the building code is a problem of looking up clauses used in other cities and copying them into the one in hand, with little scientific study or analysis of suitability for local conditions. It is an exceedingly dangerous practice to make up a set of building by-laws from the codes of other cities, for the reason that building laws seldom keep pace with the best engineering practice. The mistakes in them are as likely to be copied as their virtues. No laws should be prepared by one person only, as is often the case. In these days of specialization, no one person is sufficiently well qualified to prepare a by-law which is equally authoritative in all its parts. This is not much to be wondered at, when we often detect a bias in the smaller field of architects' specifications. A well-balanced building code can thus only be arrived at through the labors of a number of specialists co-operating with each other.

Sometimes an objectionable character has been imparted to building by-laws, through unseen but powerful influences applied during the framing. Instances of codes being "loaded" for or against particular materials and methods of construction are only too common. The most glaring example of this in recent years is the case of New York City. So much pressure was brought to bear by the clay products interests to mould the character of the proposed new code, that the draft submitted for ratification to the mayor was vetoed by that official. New York has, therefore, not as yet been able to produce a sufficiently well-balanced code to replace the code of 1906.

Canada has now reached a stage that her cities should be able to produce building codes of their own—codes formulated as the result of a joint discussion by all interested, the local authorities, the architects, the engineers, the contractors and builders, and finally the people who will pay for the building—the business interests. A fair, open-minded discussion among the representative committees of all these should evolve a code satisfactory to all. The local authorities and city architects should welcome the public spirited advances made by the various associations looking towards a revision of the building by-laws.

Unfair conditions in a building by-law may work untold injury to a city. No one will argue that any chance should be taken in the safety of a structure, but this desire for strength should not be carried to the limit of waste.

It was stated in the daily press last October that in Toronto alone over a million dollars a year is absolutely wasted, owing to the undue severity of city ordinances. Montreal has awakened to the importance of a thorough revision of her by-laws. A commission has been at work on a new set for some months. Their report is being awaited with great interest in building circles.

We understand that a public-spirited committee of representative architects, engineers, builders, and business men have been studying the Toronto code, with a view of suggesting improvements. The results of their investigations should also soon be made public. It will be, to say the least, most unfortunate, if the civic authorities do not meet them with an open mind, to discuss their memorial when it is presented. We can but hope that as a result of this report that an expert commission will be appointed to fully investigate their case with powers to formulate a new and up-to-date code, which will be thoroughly in accord with the best engineering and building practice of the day.

This commission should be representative and reasonably small. Outside the city architect, a practising architect, and an engineer, it would be entirely without our province to suggest the composition. We are, however, convinced that any such commission should not be loaded up with aldermen, or, in fact, any persons who could not qualify under the term "expert."

It is most unfortunate that the points on which most objections to present laws are made refer to the disabilities placed on fireproof buildings.

The recent apartment house fire in Montreal, most forcibly brought to the attention of the eastern metropolis the importance of providing for and enforcing a most adequate system of fireproof construction in public and semi-public buildings. The usual outcry of the "man in the street" has been raised, demanding that the laws must be changed.

The opinions of the insurance men on this question are always worthy of notice. We quote from one of the Montreal papers:

"Mr. J. Gardner Thompson, local manager of the Liverpool & London & Globe Insurance Company, was of the opinion that the city building regulations would have to be revised.

"'They should be brought up-to-date and then strictly complied with,' commented Mr. Thompson, who added that efficient building regulations, if properly observed, besides having a most beneficial effect, would, no doubt, result in the lowering of insurance rates, which, in some districts of the city, were abnormally high.

"'The rates are governed by the laws,' concluded Mr. Thompson, 'and as long as the laws remain insufficient and are unobserved, rates will be high.'"

That dissatisfaction is general with the building codes throughout Canada is evident. In the opinion of the BUILDER AND CONTRACTOR it is high time that some definite step should be taken towards a solution of the difficulties. This can only be accomplished by the co-operation of all concerned.

It is to be hoped that with this costly lesson fresh in their memory that the Montreal authorities will push a new code to a successfulll consummation.

Canadian and United States Building Progress

It is interesting to compare building operations in the United States and Canada for the first quarter of 1911. Outside of the municipality of greater New York the expenditure arranged for under the building permits issued reached a total little less than for the three months of 1910, and was in excess of any earlier year. It does not follow that, excluding that city where buildings operations have taken a decided slump this year, activity has been general. Such an impression would be entirely wrong, as at such important centres as Chicago, Kansas City, Seattle, Spokane, Tacoma, Denver, and Salt Lake City, construction work has shown a noticeable decline. At many other points, however, unprecedented activity has prevailed, so that the aggregate outside of New York for the quarter comes within 3½ p.c. of equaling the record made a year ago. After the extreme activity in building witnessed in 1910 and 1909 in most sections of the country, this slight let-up is obviously of little moment.

As regards the exhibit made by March, the closing month of the quarter, it is to be said that the cities showing decreases are in the majority, 66 out of the 114 included in our compilation standing in that category. Stated briefly, the expenditure arranged for during March at the 114 cities covered by our investigation aggregates $82,380,002, that total recording a decline of 12.8 p.c. from the month of 1910, a decrease of 5.1 p.c. from 1909 and a gain of 72.2 p.c. over 1908. For Greater New York the showing is, as intimated, much less favorable than last year, the loss reaching 39.8 p.c., and there is an even larger falling off from 1909. As regards the various boroughs, Queens alone makes a better exhibit than a year ago, and the greatest loss is in the Bronx. The combined total for cities outside of New York at $66,598,197 shows a decrease of 2.4 p.c. from March, 1910, but contrasted with 1909 and 1908 there are excesses of 18 p.c. and 61.7 p.c., respectively.

The results for the quarter possess an interest that no single month can, as they furnish a substantial basis for judging the situation of the building industry, subject, of course, to such qualification as referred to above—the comparative quietness in Greater New York. There is, of course, activity in some cities and lack of it in others, as already explained. It is west of the Mississippi River that this year's aggregates generally fall behind. In New England the showing is most favorable, the total for 15 cities exhibiting an increase of over 40 p.c., due largely to heavy operations at Boston, although New Haven, Worcester, and some smaller municipalities helped. In the middle section (exclusive of New York) greater activity at Washington, Baltimore, Philadelphia, Pittsburgh, Bayonne, and some smaller points more than offset losses at Buffalo, Newark, Rochester, Paterson, Scranton, and Wheeling, etc., the aggregate for 22 cities recording a gain of 4 p.c. over a year ago.

In the middle west there is a rather important decline at Chicago for the three months, but most of the other reporting cities show results in excess of 1910, Cincinnati, Cleveland, Detroit, Indianapolis, Milwaukee, Peoria, and Youngstown being most conspicuous in that respect. Thus it is that for 18 cities we have a total 2½ p.c. greater than last year. The south also makes a little better exhibit than 1910 in the aggregate for 24 cities, Richmond and Louisville, among the more important localities, showing the largest gains, and Oklahoma, New Orleans and Memphis the losses.

In the Pacific slope returns we discern more evidence of inactivity in building in leading communities than in the sections already reviewed. At Seattle, for instance, there is a decline of over one-half, and at Spokane, Salt Lake City, Tacoma, Sacramento, and San Jose losses are reported which larger operations at Los Angeles, Portland, Oakland, San Diego, and Stockton fail to overcome. Finally, the "other western" group of cities combined shows a loss in aggregate operations for the quarter this year of nearly 13 p.c. Noteworthy declines are found at Denver, Kansas City, Davenport, Duluth, Lincoln, and Topeka, and mentionable gains are confined to Minneapolis, St. Paul, Des Moines, and Superior.

For the 113 cities outside of New York the contemplated outlay for building operations in the three months this year aggregates $135,328,307, against $140,199,197 in 1910, or a loss of 3.5 p.c.; but comparison with 1909 and 1908 reveals gains of 7.4 p.c. and 61.3 p.c., respectively. The result in Greater New York for the quarter of 1911 covers a decline of no less than 24.2 p.c. from 1910, the contrast being between 39⅞ millions of dollars and 52½ millions. Moreover, there is a decrease from 1909 of 43.4 p.c., but compared with the low total of 1908 there is a gain of 100 p.c. For the whole country this year's three months' aggregate at 114 cities is $175,195,968, against $192,689,030, or a falling off of 9.1 p.c.; contrasted with the outlay in 1909 ($196,453,340), there is a decline of 10.8 p.c.; but the gain over the inactive period of 1908 is 68.7 p.c.

The Canadian statistics for the same three months are interesting. If anything, taking the first three months is apt to place Canadian conditions in a very unfavorable light, owing to the backwardness of spring, business opening later in Canada than in the United States this year. This applies most particularly to Winnipeg, which, this year, promises to outdistance all records.

	3 mos. '10	3 mos. '11	Increase p.c. for 3 mos.
Vancouver	$3,318,212	$4,607.330	39
Toronto	3,125,693	3,638,940	16
Montreal	1,110,344	2,109,845	90
Calgary	692,100	1,641,960	137
Winnipeg	3,067,050	1,639,600	−47
Regina	382,490	622,225	63
Victoria	525.505	614.340	17
Edmonton	337.555	519,055	54
Hamilton	346,040	465,000	34
Ottawa	374,200	228,075	−39
Fort William	162,200	202,175	25
Lethbridge	212,605	140,000	−34
Windsor	37,975	113,625	199
Moose Jaw	69,875	87,100	25
London	221,832	85,863	−61
Quebec	43,300	85,000	96
Brantford	26,670	60,645	127
Halifax, N.S.	88,975	36,600	−59
St. John, N.B.	94,750	30,200	−68

Some of the smaller cities show a decrease, but on the whole, with a much later spring, Canadian statistics show an increase of over twenty per cent. over the corresponding period of 1910.

Electric Wiring

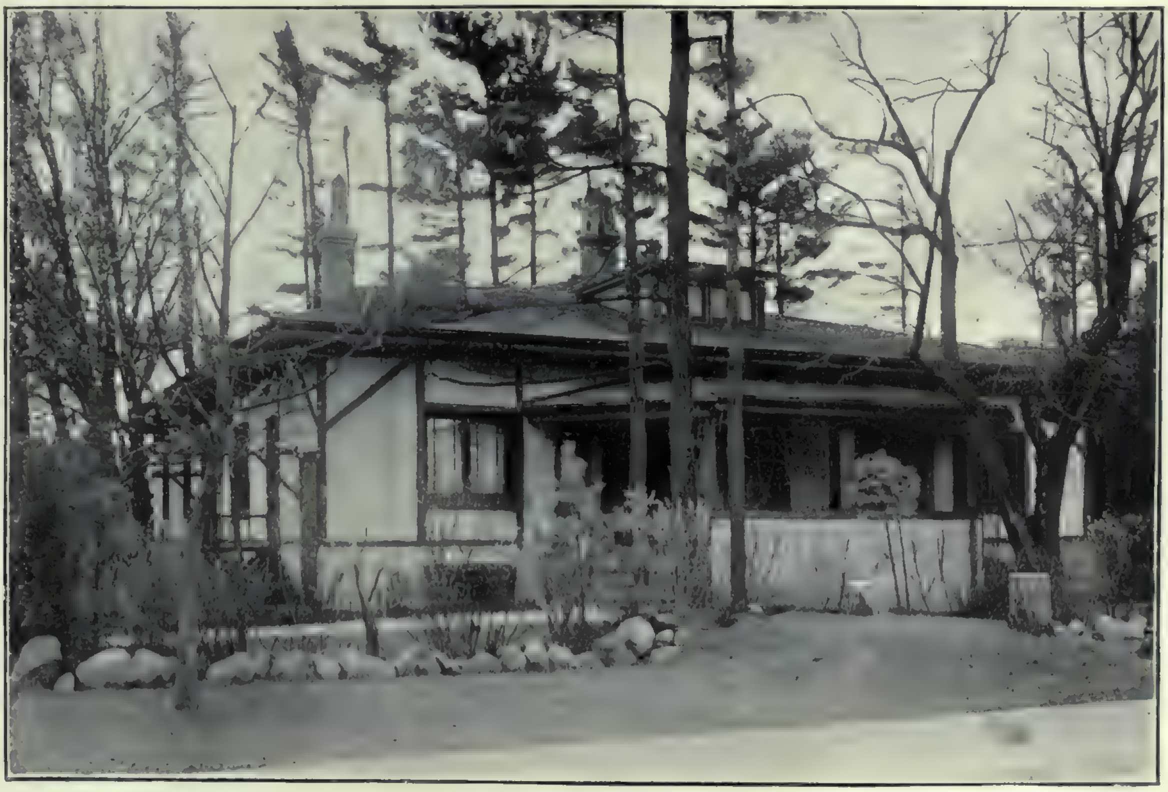
The electrical department of the Canadian Fire Underwriters' Association have requested us to call the attention of builders to the fact that the placing of the seal on the door and other portions of the woodwork of the buildings, which they are having wired, is merely an indication to the lathers that they may cover up that portion of the wiring which is to be concealed, and does not constitute an acceptance of the work until the final inspection has been made after the building is completed. These final inspections are not made until the association is subsequently notified that the work has been entirely finished, and if you release your contractors before receiving their final written certificate there is likely to be some delay in obtaining the electric service to either the builders or parties who may either rent or purchase the building from them. In releasing electrical contractors it is suggested that builders obtain the written certificate, which will be issued when the association has been notified by the contractors that their work is completed and after the work has been finally inspected and found to be satisfactory in all respects.

What is a Bungalow?

The Name Bungalow is Applied Indiscriminately by the General Public to Nearly All Houses of a Low Set Artistic Type.

Jas. H. Craig

Perhaps there is no class of habitation about which there exists a greater curiosity in the minds of the middle class of both Canada and the United States, than one finds to-day in regard to the type of house, designated by the word "Bungalow." It is a popular topic of the pictorial magazines, and even the daily newspapers have touched upon the subject to some extent. While such a ready response to the popular demand for information about home building is gratifying, one cannot but reach the conclusion that the greater proportion of effort to meet the demand fails utterly in serving a useful purpose. Some of the material published has even been misleading, and the general misunderstanding arising from this and other causes with regard to this particular type of dwelling, has prompted the question: "What is a bungalow?"

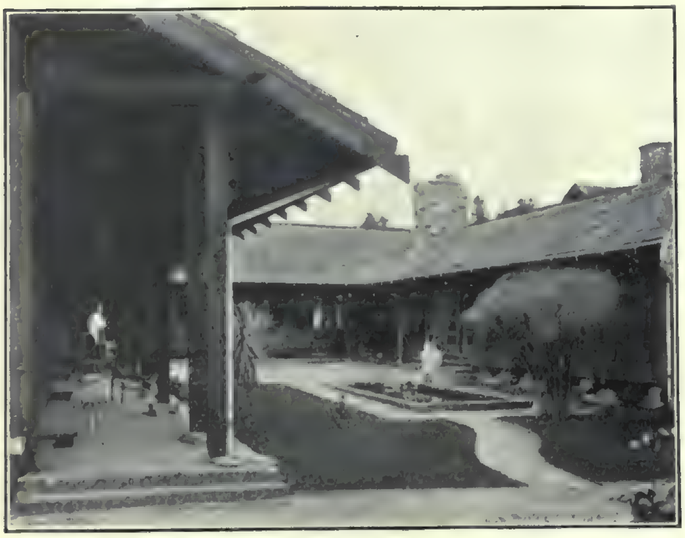


Home of A. M. Grantham—True Bungalow, Suitable to Canadian Climate

The name bungalow is applied indiscriminately by the general public to nearly all houses of a low-set, artistic type, and sometimes to larger houses of an uncommon variety. While climatic and economic conditions will, of course, give a local significance to the local use of this word, this fact cannot be offered as an excuse for the loose and promiscuous usage which has resulted in a gradual obscuring of the original meaning, and which, if continued, eventually would rob the word "bungalow" of all definite significance. In order to properly interpret this word, as applied to a Canadian residential type, it is necessary to recall its origin and purpose. The bungalow originated in India, the name being a corruption of the native word Bangla, "Bengalese," and probably refers to the district where this class of dwelling was first noticed by Europeans. The demand for a comfortable abode in a hot climate had resulted in the development of a number of very definite characteristics. The pyramidal roof, generally of thatch, with its overhanging eaves often projecting to serve as a verandah roof, afforded a cool and restful retreat from the rays of a tropical sun. The planning called for large rooms lighted by plenty of windows, and as the main walls were of temporary construction and not tightly ceiled, a free circulation of air was provided for. The type seemed peculiarly adapted to the need of the Englishman who wanted to be as comfortable as he could during a comparatively short period of occupation, and thus we find the dwelling commonly provided for officers' quarters in the cantonments. It may be noted that Indian houses of masonry having rooms above those on the ground floor were called pucka houses, a distinction being made between the more elaborate structure and the bungalow. The Indian bungalow then, is essentially a house of one story in which the provisional and informal have reduced to a minimum the defference between indoors and out.

In dealing specifically with the Canadian bungalow, one might ask if the adoption of a tropical type of dwelling to the need of a people living in the temperate zone, would reflect good taste or sound judgment. In the southern parts of the United States the climate cannot be called tropical, and much less can our Canadian climate be characterized by that term. The above, then, would seem to be a pertinent question, for in order that a house may properly be called a bungalow, it must possess some of the essentials of its Indian prototype. There are, however, other elements which must be reckoned with. Canada is a new and growing country, drawing her population from every nook and corner of the earth. The cosmopolitan influence of such a population will be shown in Canadian architecture, and in a newly evolved type, such as that of our text, one may expect to find many features in common with houses of the same size and of similar materials built in other countries. Then, while some of the essential features of the historical type are retained, other influences may so modify the bungalow as to make it a habitable dwelling for our colder Canadian climate. In a further consideration of this point we will seek to justify the Canadian people as bungalow builders.

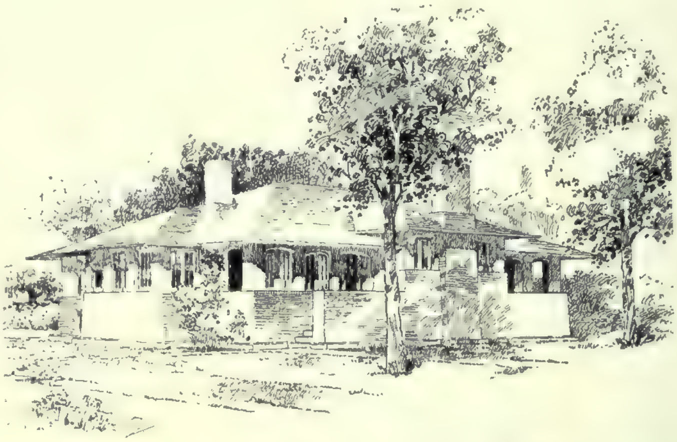
The Canadian will receive his immediate inspiration from the type which has been developed on the Pacific Coast. Southern California may be called the home of the American bungalow; here, while not tropical, the climate is warm and dry, and as most Californians are people of substantial but moderate means, and of informal tastes, this class of house readily adapts itself to the existing need. Japanese models have played their part in influencing American bungalow architecture. The Japanese enjoy a period of cold almost equal to that of winter in the milder parts of Canada. However, the Canadian and Japanese do not provide for this season in the same way. The Canadian fortifies his house against the frost by means of thick walls and an elaborate system of heating, while the Japanese plans his house for the warm weather, making no adequate provision against the cold. The summer bungalow, then, will most be influenced by Japanese examples. The sleeping porch, with its sliding shutter-like windows; the light but faultless construction of wooden structures; simple interiors; floors covered with matting; all these tell of this wholesome influence.



Bunglow of C. W. Hollister, Hollywood, Cal. Greene & Greene, Architects

The Patio or open Court is derived from Spain

Then the Swiss house, with its broad, overhanging roof, has had its influence. This roof projects over both the gables, and the sides, sheltering beneath its broad eaves, galleries approached by wooden staircases. This style of roof is the one most used in Californian work, porches and verandahs taking the place of galleries. From Italy has been derived the pergola and from Spain the patio or open court. The house of Mr. C. W. Hollister, Hollywood, California, gives an interesting example of how the latter has been used with good effect.



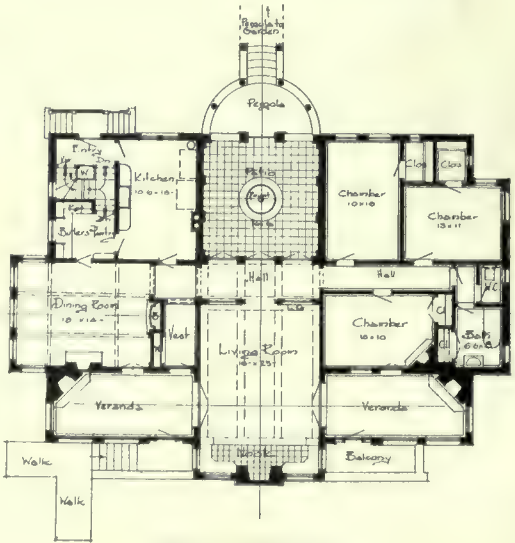
T. Robert Wiegert Archited

Typical California Bungalow

It is now evident that the American bungalow, while retaining many of the essential characteristics of its historical prototype, has adopted other features which tend to make it a cosmopolitan product.

The typical Californian bungalow may be considered an embodiment of all these foreign influences, and as real Canadian bungalow architecture is yet in its infancy, a further consideration of the Pacific Coast type may be appropriate.

A typical California bungalow is shown in the sketch by A. S. Barnes, architect, Los Angeles, Cal. Its low, rambling roof lines are characteristic. The exterior is designed to be built of shakes. "Shakes" is a term used in California and applied to shingles of a large size. They are about one-half inch in thickness, six inches wide, three feet long, and are laid from twelve to sixteen inches to the weather. The rustic effect obtained by the use of this



SKETCH OF BUNGALOW.

treatment of the superstructure in harmony with a cobble stone foundation is, in this instance, pleasing.

The bungalow by T. Robert Wieger, architect, of Denver, Col., shows a carefully studied and well arranged plan. The elevation is in keeping with the plan and is expressive of a degree of refinement not often shown in this class of work.

The Californian bungalow is found in suburban towns and in the country. The rooms are spacious and are designed, as far as convenience and propriety will permit, to tempt the eye outside, where the prospect should be pleasing. The house is "built into the landscape," sacrificing its architectural individuality to become an integral part of its natural setting. Hence, the woodwork, whether the house be shingled or clap-boarded, is stained in soft tones to correspond with the natural colors of the tree trunks and the surrounding foliage. The roof, combining, as it does, a broad area with an inconsiderable height, becomes the most prominent architectural member. It must have projecting eaves, which will cast deep shadows, making sharp contrasts in line and shade to compensate for the moderation of color.

Greene & Greene, Architects
Bungalow in Pasadena, Cal., showing the Swiss Influence

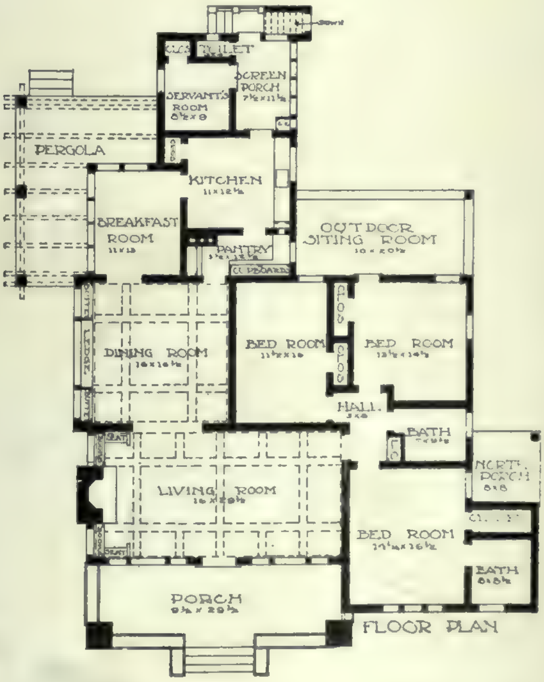
A combination of the practical and aesthetic as described above constitutes an appropriate architectural type, and when completely fulfilled should result in the bungalow at its best.

The suburban town lot will not often provide for the bungalow an artistic setting, and one must look to the country would he find an ideal landscape. However, we seldom have to do with ideal conditions, and town lots must often suffice. In such instances, an appropriate training of vines and arrangement of trees and shrubbery will add much in interest and lessen any tendency toward the commonplace.

The characteristic features of the bungalow are being extensively adopted in nearly all classes of Californian residential work. Some of these features have been used in higher and larger houses with good effect, but more often the result is very poor. The freakish houses which generally result, may at first please the untrained eye because they are "different," but, like the so-called popular music of to-day, they will ere long lose all popularity or semblance of beauty. The house at 665 South Orange Ave., Pasadena, Cal., shows an adaptation of the bungalow method of treatment to the higher house. Here the low roof, with its wide eaves, huddles over the walls, which support it as if to cover a multitude of architectural sins. The whole effect, instead of being light, graceful, and picturesque, is awkward and inept. In Canada, while the real bungalow has been neglected, the tendency toward "bungalizing" higher and more costly houses has asserted itself, and this is primarily responsible for the misuse of the word.

A. S. Barnes, Architect
The Perjola is derived from Italy

Although the majority of Californian bungalows are of wood construction, many are built of brick, hollow tile and concrete. Our colder climate, then, will warrant the use of these more substantial materials, particularly if the house is to be inhabited during the colder seasons of the year. However, if these permanent materials be used, and the provisional and airy construction, which characterized the prototype be sacrificed to climatic conditions, the other essentials of the bungalow type must be retained if the dwelling is to be worthy of the name. Two Toronto houses built for both summer and winter occupation are illustrated herewith. The house of Mr. A. M. Grantham, 181 Balmoral Ave., with its background of evergreens, low pyramidal roof, compact plan, and simplicity of treatment, is unmistakably a bungalow. Other examples of Canadian bungalows follow elsewhere in this journal.



The bungalow, if it is to be a residential type and something more than a passing fad, must be an embodiment of certain definite principles. Having briefly reviewed these fundamentals in conclusion, one might offer a word of warning as to the danger. The worship of the past exemplified by an undue striving after the picturesque is perhaps the chief danger to be avoided by the prospective bungalow builder. Immense cobble stone piers, supporting a light verandah roof, attract attention and emphasize some thing which has no need of emphasis. The resulting break in scale is very detrimental, for it causes a violation of the first principle of all art. The builder will do well to follow the advice of Mark Twain: "When in doubt tell the truth." This principle of truth underlies all good design and may be adopted as the final test by means of which to gauge any piece of work. Does the plan provide a convenient and comfortable arrangement of rooms? Does the method of construction call for the economic use of those modern materials which are available? Does the elevation tell only the truth? If an affirmative answer may be given each of these questions the design will be pleasing and the house will be ever popular with those who make it a home

Conscious City and Town Planning

The Practice of Town Planning Under the Housing and Town Planning Act, 1909*

By Frederick W. Platt, Building Surveyor, Salford Corporation

The Housing and Town Planning Act has been before the nation for a year. It has within it the essence of much-needed reforms in housing and kindred matters; but the most important features it contains are the clauses dealing with the future planning of towns. That these are novel to this country is well-known to all of you; but has it been realized that included among them is a very stringent clause which provides that all local authorities shall, if cause be shown that a town plan is needed, prepare such a town plan, and that, failing to do so, the Local Government Board may subject to certain conditions, require them to adopt a scheme of the Board's preparing. This is practical legislation with a driving force behind it! Let us then at once consider what these town planning powers are.

The Act gives local authorities power to operate jointly or severally in this matter. They may apply to the Local Government Board for authority to prepare a town planning scheme. Such a scheme may be made in respect of any land which is in course of development or likely to be used for building purposes, with the general object of securing proper sanitary conditions, amenity and convenience in connection with the laying out and use of the land and of any neighboring land. The Local Government Board, on being satisfied that a prima facie case has been established, may authorize the local authority responsible for the scheme to include therein land already built upon, and may in consequence of such inclusion make provision for the demolition or alteration of buildings erected upon such land, so far as may be necessary for carrying the scheme into effect. Local authorities may, with the consent of the Local Government Board, adopt with or without any modifications a scheme promoted by all or any of the owners of any land with respect to which the local authority might themselves be authorized to prepare a scheme. As to what may be included in the scheme, Schedule 4 of the Act gives very full particulars. These include such matters as power to deal with streets, roads, etc., diversion thereof, and stopping up of highways, easements, rights of way, sewerage (including disposal), drainage, water supply, buildings of all sorts, financial assistance or gifts of property for the furtherance of the scheme, modification of existing statutory powers, by-laws, etc., preservation of objects of historical interests or of natural beauty, power as to agreements with landowners, financial clauses, ancillary powers and ancillary works, etc. Upon these and other matters the Local Government Board are to make general provisions.

As a scheme need not be co-extensive with or confined to the area of any one local authority, but may include land in the area of more than one local authority, power is given in the Act that when such a scheme is approved there shall be created out of the local authorities concerned a new authority, whose sole duty it shall be to enforce the observance of the scheme. This authority is termed in the Act the "responsible authority." The specific duties of this body and of the local authorities concerned with the scheme will be defined in those special provisions which are to be prescribed by the Local Government Board at the time the approval of the scheme is given. Any local authority not preparing a scheme where necessary, may be called upon to do so, by the Local Government Board under certain circumstances, and in the event of their refusal the Local Government Board have power to compel them to adopt the Board's scheme. The prodecure to be followed in the making of a town planning scheme is not simple. It is governed by the regulations made under Section 56. Briefly they may be said to describe the various stages of the development of the scheme. They are three in number, viz.:—(1) Procedure anterior to and for the purpose of making an application for authority to prepare or adopt a scheme; (2) procedure during, on, or after preparation or adoption and before approval of scheme; (3) procedure after approval of scheme. A careful study of the 24 articles contained in the regulations should be made. It will well repay the labor involved.

The Act also initiates new features in the matter of compensation. Land or property included in a scheme approved by the Local Government Board shall not be deemed to be injuriously affected by the limitation of the number, height or character of the buildings to be erected upon each acre thereof or by the prescribing of the amount of open space about the proposed buildings. Further than this, property cannot be deemed under this Act to be injuriously affected if any provisions made in respect of land are such as could have been contained in by-laws made by the local authority.

Where property is increased in value by the making of a town planning scheme the owner thereof may be called upon to pay to the responsible authority one-half of such increase. As to whether any property is injuriously affected or increased in value, the Local Government Board have power to determine this if required to do so, and their decision shall be final.

* Paper read at a general meeting of the Institution of Municipal Engineers held at the Victoria Hotel, Manchester, on Dec 10, 1910.

Powers to acquire land, details as to public inquiries, expenses of administration, safeguards for owners, approving or revoking schemes, etc., are all set out at considerable length in the Act itself. To give even a brief account of them would not be to inform but only to mislead. The Act must be studied by those concerned in its administration.

The first practical question that suggests itself to the mind of the average man on hearing of an Act of Parliament is, What is the object of the Act? Turn to Section 51 (1) of the Housing and Town Planning Act, and there is set out the object of that Act. What are the vital words? Listen to them! A town planning scheme may be made......with the general object of securing proper sanitary conditions, amenity and convenience in connection with the laying out and use of the land. A more practical statement it is hard to make! Every administrator must learn these words and then determine to resolve his actions accordingly. What then will he decide to do? He will demand that—(1) Sanitary conditions must be created; (2) amenity must be maintained; (3) convenience must be secured, and it is with these objects always in view that the land must be laid out and its usefulness established. Administration then will be directed towards this goal.

Administrators though are of two kinds: The man or woman—often an enthusiast—who becomes a member of a local authority, and the trained official whose duty it is to crystallize the desires of the elected administrators. Each has a distinct duty to perform and each is correlative to the other. The elected administrator's duty must be to convince the electorate that a change is needed, nay, has been demanded by Parliament. As a man of affairs moving amongst his townsmen he must be prepared to study them sociologically. His efforts must be directed towards obtaining a knowledge of the probable advance in industry in the town; what processes are most likely to grow and in what direction expansion will take place; what are the specific needs of the people in the matter of dwellings; how are they affected towards a particular type, and is that type one which but for lack of another they would not have become attached to, or is it merely a case of "survival of the fittest" although the "fittest" is "unfit"; is there within the district a healthy type of dwelling that is eminently suitable for the climate of that particular area. He must also use his imagination as to the appearance of the future completed town, and endeavor to instil this into the minds of his constituents, encouraging them by telling them that whereas formerly this picture might only be a dream, dependent for its fulfilment upon the will of the landowner, now its accomplishment could only be prevented by lassitude on the part of the electorate. In a word, to be successful he must create civic spirit, civic pride and civic responsibility.

Lack of knowledge of the power of the community is the cause of much ineptitude in civic matters, just as much as the hasty action of a local authority in supplying a panic demand formed upon an inaccurate understanding of an important statutory advance has often caused a revulsion of feeling against a not only desirable but essential reform.

In this important matter of town planning the practical question to be kept to the front is, Does the electorate thoroughly understand its own needs, and are its members satisfied that they can interpret those needs for the benefit of the community? Let it not be forgotten that whenever there is a demand for new building someone is always ready and able to supply that demand. If but once it be recognized by the electorate of our towns and suburban areas that, whereas formerly their control over town development was but slight, now it is such that the very positions of the streets and houses and extent of open spaces around them can be fully controlled and marked upon the town plan in advance of the time, then these town planning clauses will be household words in our towns and villages.

What are the practical requirements demanded of the official administrator of town planning under this Act? Apart from a thorough acquaintance with the Act, and the regulations made under it, not forgetting that general scientific knowledge he possesses which enables him to fulfil the ordinary duties of his office, he must be prepared to apply his mind in other ways. Cecil Rhodes, it is said, "thought in continents"; most officials of local authorities think in "streets," or at the most in a "group of streets." This must be changed, and none will welcome this opportunity more than the officials themselves. Elevation of land, its contour, prevailing winds, soil, aspect of land, relation of hill to valley, situation and disposition of the source of water supply, position and direction of streams both underground and above ground, are but a few of the subjects he must study. Town planning is just as much a hygienic problem as an architectural or engineering one. Every area therefore requires a special treatment, and this appears to have been realized by Parliament, for power is given in the Act to make special provisions applicable to separate areas. Look again at the three conditions upon which a town plan may be made: Sanitary conditions, amenity and convenience.

Sanitary Conditions: These do not consist in merely making good sewers, ensuring good drainage, providing open spaces at front and rear of buildings, and all those ancillaries thereto, as laid down in the Model By-laws. They include the course, direction, inclination, and width of streets, materials with which they shall be paved, disposition and number of the houses and other buildings erected upon the streets, the planning of the rooms in the buildings so as to get the full benefit of the sunlight, the relation of open spaces to buildings and to the position of the adjoining premises. More than all these—important though they be—sanitary conditions are dependent upon that harmonious grouping of building with building and road which creates in the mind of the dwellers on the area an intense desire to obtain all that is highest and noblest in life. Environment is the creator of thoughts from which the true essence of advancement is distilled. This is illustrated daily in those of our well-planned suburbs; but its effect is conclusively proved by the statistics of the habits of the children of parents in Port Sunlight and similar places, who are not only anthropometrically in advance of their immediate neighbor's children, but are intellectually superior to them. Therefore a wider definition than the popular one quoted must be given to "sanitary conditions."

Amenity: Amenity in the execution of a town planning scheme, means that desirable association of buildings where there are no sudden variations in the value thereof, or, where a gradation from cottage to larger house forms the essential feature. The deduction therefore is that so far as is possible there shall be separate areas for residential and for manufacturing purposes. This should not be difficult to procure in a new area. In old ones it is difficult in the extreme. For many reasons—financial and physical among them—areas available for maunfacturing purposes are neither suitable nor profitable for residential use. Much study of local conditions is imperatively necessary before allocating special areas. An example of an actual difficulty might here be useful. A new area adjoining an old area is about to be developed under a town planning scheme. It is easy to plan this area, and the land is available for graduated types of dwelling, from cottage to detached house, to be erected thereon. In order to gain access to this new area, the shortest way is to pass through the old and badly developed part of the town, which has been laid out without any regard to amenity conditions. Here comes the difficulty! The prospective dweller of the detached house will not pass daily through this old and badly laid out area. His support is vital to the scheme, and he will not give it unless a more desirable approach be made to his zone. Amenity includes more than these, and its influence is directly felt in the revenue it produces to the local exchequer. A town's finances to be sound economically ought to be mainly provided from buildings whose occupants will not each require, or take, more in value from the corporate estate and its administration than their individual quota of the rate paid on their behalf by the householder. To illustrate this, it will be remembered that the most pregnant sources of the financial responsibility of a local authority to its ratepayers arise from expenditure upon sewage disposal, public health administration, and education, and that the people who largely create this responsibility and mostly benefit by it, are the inhabitants of the poorer parts of a town. Therefore it follows the higher the number of small houses which are rated below an average sum the greater is the burden cast upon the higher-rated area. The small house takes more than it gives. A town planner in the future must consider this aspect of the influence of amenity, and so design his town plan that, whatever causes have operated in the old town to bring about this adverse ratio, they shall not exist in his scheme, and thus the means may be provided whereby this deficiency of rateable value will be corrected.

Convenience: Convenience may be defined in many ways. Roads easiest in gradient, most direct in course, and best available for the use of the majority of the people will be needed. Their uses and the connections they will make with roads in adjoining areas should form the subject of much careful thought; the ratio of space for vehicular traffic to that for foot traffic, together with the possible need for increasing both in future, will demand attention and foresight. Means for conveying the public services of light, power and sewage must be furnished. These in themselves all make for convenience to the inhabitants. Much more might be said under this head; sufficient it is to cause everyone whose duty it may be to administer the Act carefully and thoroughly to familiarize themselves with the demands which will be made upon them.

That demands for an active administration of the powers of the Act will be made is a certainty; that the local authorities will have to satisfy them is equally sure. Let the demand find us ready and fully competent to cope with it; for depend upon it the burden will, in the first instance, fall upon the municipal engineer and surveyor. If he be found wanting, the control will pass from his hands, and a work for which he should by reason of his especial knowledge be the fittest person to undertake will be executed by another. The task before you is a noble one, the cause is a good one, and the reward the best that can be given—the knowledge that you have not only served and improved the present race, but have provided for the generations yet to come a better heritage than that inherited by yourselves.

Town Planning in St. Paul, Minn.

The city of St. Paul, Minn., is going in for city planning, and has engaged an expert to map out the best features to be adopted towards this end. A perusal of his ideas is interesting, because of the similarity of some of the proposed improvements to features already under way in some of our Canadian cities. It is contemplated in St. Paul, for example, to construct a station plaza, paying particular attention to the needs of traffic. This, it is considered, if of sufficient size and imposing enough in appearance, will create a favorable impression on the traveling public. St. Paul will likewise develop a civic center and a business center by widening certain streets, and one feature of the plan is that there shall be distinct districts for public buildings, business establishments, residences, apartment houses and factories. Any departure from this policy, the designer insists, will be sure to upset the harmony and effectiveness of the scheme. The reason why this phase of the subject receives prominent mention is that a project was on foot recently to erect a factory near a magnificent new cathedral now under way in the city. If the interests of each district can be protected from encroachment by interests in other districts, real estate values, it is claimed, will be increased, and the city benefited in all respects.

But the feature of the St. Paul plan worthy of note by other cities is the feature which is at present claiming attention in Canada, the plan for railway and street car connections. St. Paul is inclined to think that the solution of the problem will lie in the electrification of railroads at present getting their motive power from steam, and the bringing of local and inter-urban lines into close affiliation. The city plan for the future, it is thought, should make provision for fit connections between street railways and both passenger and freight depots, for the trolley freight business is sure to develop.

The fact should not be lost sight of that the plans now contemplated are for the whole future—not to-morrow, and that all the features may not be worked out for fifty years. Minneapolis, the sister city of St. Paul, has spent $12,000 on its city plan, without spending a dollar on construction, because it has been drawn on the assumption that the city will some day have a population of one million.

In all cases it is well to bear this in mind. It is not the immediate future we must look to, but what this city will be in twenty-five or fifty years. A scheme to improve the city now may cost a large amount of money, but the cost in the end must prove to be comparatively small.

Examples of Bungalows by Canadian Architects

Residence R. Ellis, Bedford Park Curry & Sparling, Architects

The bungalow, as has been pointed out, is essentially a house for suburban or country location. In it great scope is given for the display of taste on the part of the owner and architect, both in the interior and exterior arrangement. Every individual bungalow must be more or less a product of circumstance. In plan it must be suited to the life of the family inhabiting it and to the conditions imposed by the site.

Its exterior arrangement will be governed largely by the site and the surroundings. The expenditure desired will, of course, greatly influence the materials of construction and size.

We illustrate in the following three distinct types of the structure, which, in the popular mind, answers to the term bungalow. Two are distinctly bungalows, the third might be better styled a cottage of the bungalow type. All have been erected in the last few years, each of a different building material.

The first one is the residence of Mr. Reg. Ellis, at Bedford Park, Ontario. This is one of the many really artistic bungalows designed by Messrs. Curry and Sparling, of Toronto.

The original reason for making Mr. Ellis's residence a bungalow was a desire on the part of the owner of having all the rooms on the ground floor, with as many of them as possible overlooking a section of low country or valley.

The situation of the bungalow is most effective, being on the brow of a hill. On two sides the ground slopes in terraces to a small stream running through the valley. On the other side is a fine clump of pine trees. The architects have certainly in this case taken every advantage of situation. The surroundings and dwelling have been adjusted each to the other, so that a charming view is presented from every angle.

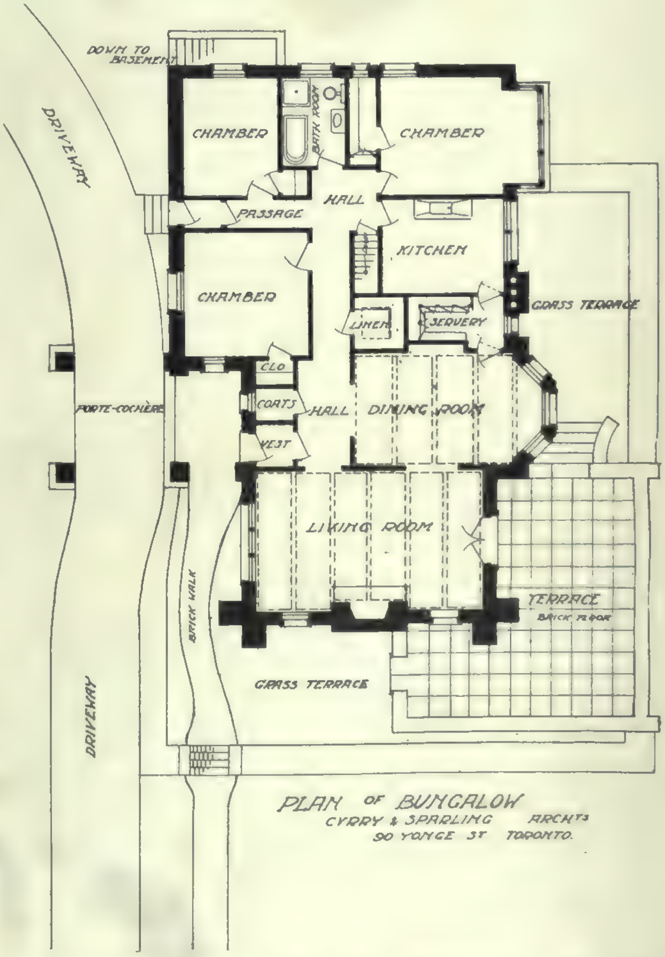
As seen in the plan, the principal rooms are *en suite,* with a large living-room opening out on to a stone terrace, and with doorways from the entrance hall and dining-room.

The living-room and dining-room have beamed ceilings, both having an immediate outlook on the brick and grass terraces which adjoin the house.

The characteristically large fireplace in the living-room lends material aid not only to the comfort but also to the appearance of the picture.

The entrance hall leads into all the rooms in the house, and also provides an entrance into the basement. At one end is a small passage connecting it with the side entrance.

A large laundry and an extra bath-room are placed in the basement, together with the boiler-room and fruit cellar.



The exterior walls are built of rough quarried white marble laid in grey mortar without any attempt at squaring off the edges, etc. The marble is laid with the rough angles pointing in all directions.

The roof has the characteristic wide eaves of the bungalow. A touch of color was given it by the use of red Belgium asbestos cement slates. This was the first instance of these slates being used in this part of the country. Their selection proved most happy, and since have been used on quite a number of the residences in the vicinity. Their uniform size and lightness compared with similar roofing materials not only produce a pleasing effect, but also lessen the difficulties of roof framing and design.

Taken all in all the architects have produced a dwelling which is a credit to themselves and must be a source of pleasure to its owner.

A Frame Bungalow of Modest Design

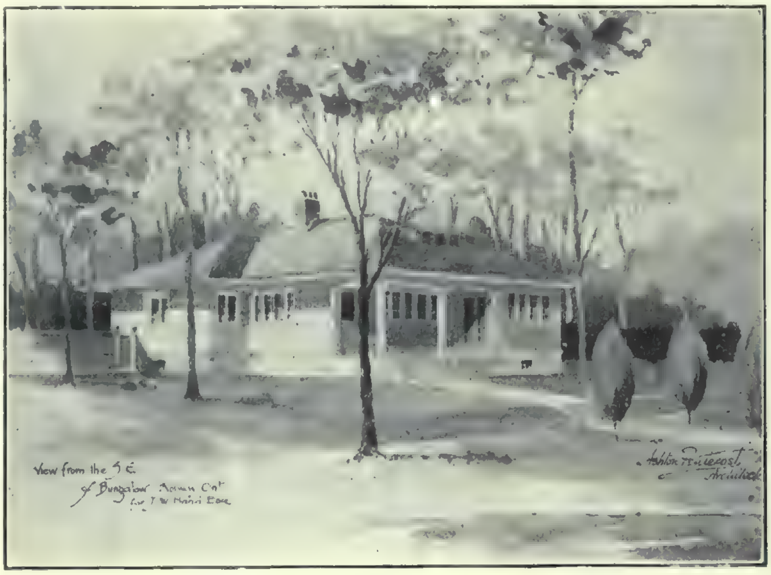
Ashton Pentecost, Architect

It is seldom that one can obtain for this comparatively modest outlay a permanent house such as this, combining as it does beauty, size, and convenience; yet it has been proven in this case, this bungalow having been built within the last four years for the sum mentioned, in a suburban district. The English home-like lines on which the exterior has been designed, combined with simple planning of the interior, have more than fulfilled the idea of a home in its true sense of the word, and at a moderate expenditure.

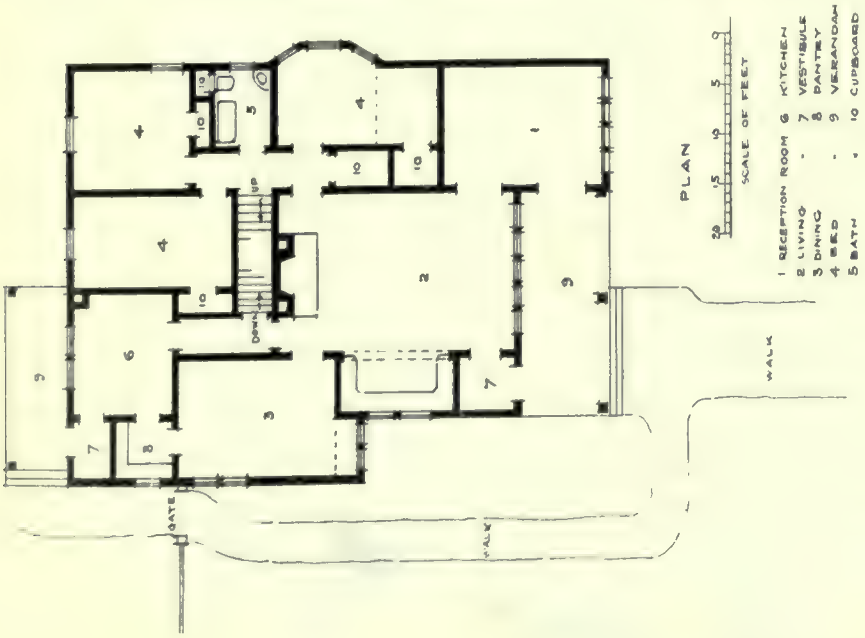
The cellar, which is built of concrete, contains, in addition to the heating and coal rooms, roomy storage accommodation. The main floor has as its main feature a spacious general living-room, with cosy alcove to the south-east, and an 8 feet wide brick mantel, with fireplace capable of taking 4-ft. logs. This room has, as will be seen by referring to the plan, a main entrance off the broad verandah, also from which is an extra entrance to the reception-room by means of so-called French windows.

A noticeable fact in this plan, and one that is so often overlooked, is that all the rooms radiate and are easily accessible from the living-room. The upper storey, containing at present one large play or store-room, is capable of being converted into two extra large bedrooms and their accessories. The exterior of this charming home lends itself to be easily treated in various other ways, for instance, an all-over treatment of roughcast or the quaint English half-timbered work effect, with its purple stained timbers and grey stucco panels.

This bungalow at present which is most happily situated, being almost buried in a mass of large trees, and hardly capable of improvement; but on a lot devoid of such natural beauty could be made the centre of a beautiful picture, framed in English flowering shrubs, hollyhocks, roses.



Bungalow of J. W. Hand, at Norway, Ont.

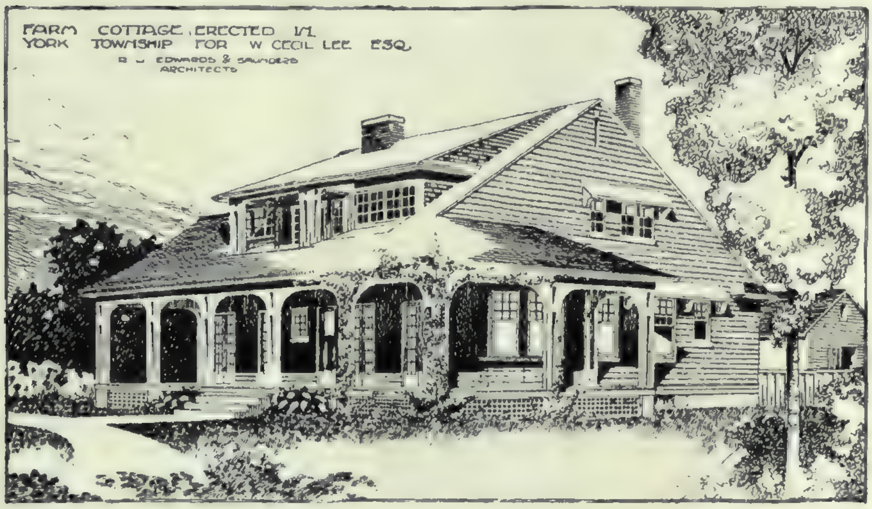


In another article in this issue appears Mr. Havlick's able paper on Concrete Blocks, which deserves the study of all intending builders. Owing to the rather injudicious use of these blocks in their early stages, a strong prejudice has been aroused in certain sections against them. The rapid advance in their process manufacture has now removed these grounds. A splendid result could be produced in this case by the very effective broken ashlar finish, which can now be readily obtained from the leading cement stone manufacturers throughout the country. Some companies are imitating the plan of selling ready-made bungalows in the block pattern, after the same method as the ready-made frame structures.

Summer Cottage on a Farm—Bungalow Type

Edwards & Saunders, Architects

The plans and perspective view illustrate an attempt to solve in a satisfactory manner an idea that has much to commend it to a city man who may be fortunate enough to own a small farm or country place within easy reach by motor car or suburban railway. Such a place may be profitably worked by a man in charge, and will afford to the owner all the advantages of country life in summer with the minimum of worry or trouble, and, it may be said, without extravagant cost. The proper water supply, sanitary arrangements and comforts of life in town are not left to chance, and the milk supply, poultry, eggs, vegetables and garden stuff are at hand in all their freshness and purity.



Farm Cottage

The plan provides on the first floor for the living rooms of the people in charge, with an additional room on the second floor if required, while, practically, the whole of the space on the second floor is reserved for the owner and his family. For greater privacy the three rooms and dressing room on this floor communicate without the use of the hallway. Two large, well lighted clothes closets are provided, and a balcony or sleeping porch.

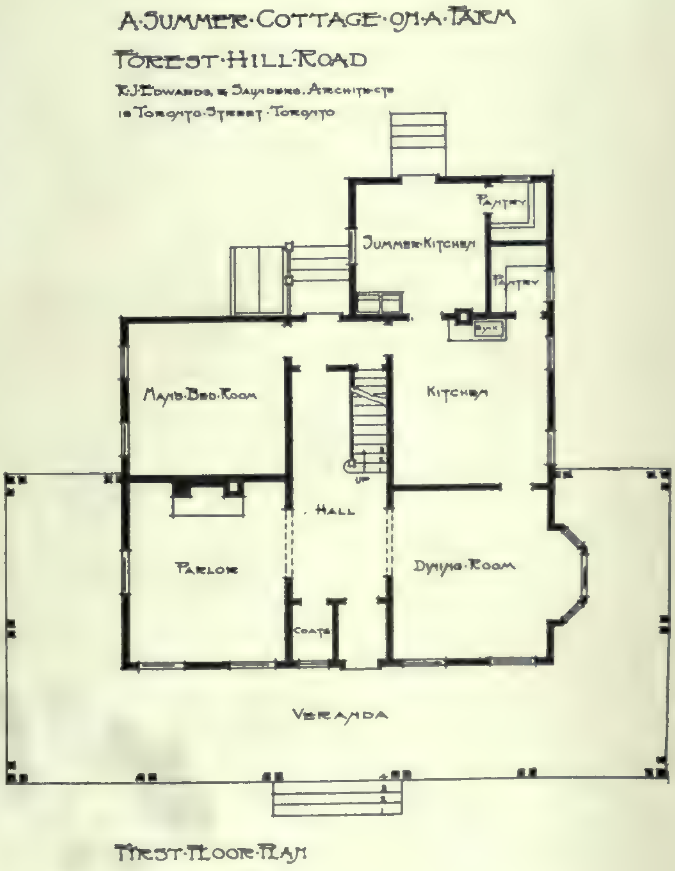
On the first floor the dining-room, parlor, and the broad verandas on three sides are also intended for the summer use of the owners. In this cottage the water supply is from a well with a force pump in the cellar and a tank in the attic, with a pump in the kitchen so arranged that drinking water can be pumped direct from the well. The extensive roofs furnish an ample supply of soft water, which is stored in a large cement cistern and pumped to a tank in the attic, and supply the bath-room and laundry tubs. By a cross connection the well water is available for the fixtures supplied by the soft water, should there be a long spell of dry weather.

The drainage is to a cement septic tank, from which the overflow is by a system of sub-surface drainage to the lower ground.

The foundations are concrete (gravel being found on the farm), and a furnace is installed for winter use and in case of need in other seasons. The furnace method was adopted instead of hot water for convenience and economy when it can be cut off from the unused rooms in winter. The roof shingles are stained green, the clapboarded walls light straw color, and the trimmings ivory white.

Every provision was made for warmth in winter by building felt and tarred paper in the walls and storm sashes and doors on the lower floor.

The progress of invention is every day rendering life on the farm more and more attractive, almost every improvement of the city now being available. If electric light is not available the various methods of individual gas plants, either stored in tanks or manufactured from gasolene or acetylene, have the advantage of providing both light and heat. Again, the pressure tank provides a thorough system of water supply, with all its attendant advantages for sanitary purposes and fire protection. In another issue we fully described a septic tank, which finds a general use under these circumstances.



Composition and Manufacture of Bituminous Roofing Materials

Those Supposed to be Experts in the Matter Differ Widely in Their Statements as to Essential Details

Information concerning the relative value of the bituminous materials for roofing is not easily available. The detailed knowledge held by the leading concerns preparing the materials has been acquired by expensive experience and is regarded as a valuable asset not to be shared by possible competitors and the ignorant purchaser. Those supposed to be expert in the matter, the manufacturers and the engineers, differ widely in their statements as to essential details.

The quality of the salesmanship is often below that of the roofing. The roofing advertisements are generally full of buncombe and the representative is sent out with a stock of talking points, many of which are misleading, to say the least.

Those who have listened have been filled with confusion. We have endeavored to present some points which might help to clear up this confusion.

The bitumens are compounds of many different hydrocarbons with different chemical formulas and widely-varying melting points. They are always accompanied by greater or less amounts of impurities, and are obtained either naturally or as the heavier distillates or residues of coal, petroleum or other organic substances. Their distinguishing characteristics are their elasticity and binding power or adhesiveness, their considerable immunity from action by water and their solubility in oils and certain other organic compounds. The bituminous substances vary so, and the knowledge concerning them is so limited and new that considerable confusion in regard to nomenclature and classification exists.

In the commercial preparation of the different bitumens obtained from coal and petroleum, distillation is used to mechanically divide them into classes of compounds having similar physical qualities. When in this process sufficient heat is applied to cause a chemical breaking down of some of the hydrocarbons, which ordinarily tends to separate them into their constituents, the operation is termed cracking.

Asphalt.—The term asphalt is ordinarily considered as referring to bitumens found naturally in the solid state and will be so used in this discussion. These are obtained all over the world with widely-varying qualities. Mention will be made of those most important commercially in this country.

The asphalts are generally stable in the atmosphere. As found naturally, they are not commercially available, even after the impurities are removed, being too hard and brittle for most purposes. This is ordinarily remedied by softening or fluxing with various oils, an operation requiring skill. The character of the fluxes has a most important effect upon the finished product. Petroleum products are ordinarily depended on for this purpose. The fluxes should be sufficiently stable to insure against too rapid hardening of the fluxed asphalt. They should be free from deleterious constituents and should be of such a character that they will combine with the asphalt to be fluxed so as to make a homogeneous and perfect solution. Certain fluxes which work well with certain asphalts are not at all suitable for use with other asphalts. Poor results are sometimes supposed to be due either to chemical action in the fluxes or to chemical action between the fluxes and the asphalts. Tars are sometimes employed for fluxing purposes, but they do not mix easily with the asphalt. As asphaltic compounds age they tend to become brittle and hard, losing their elasticity and binding power. Poor fluxing hastens this process.

Commercial refined asphalts intelligently and honestly refined should and do run very uniform. When they are compounded, however, brand names have very little significance, and less value, and should not be taken in themselves as indicative of the character or value of the compound. Some types of asphaltic compounds properly prepared and used have qualities which make them almost indispensable for some classes of roofing.

The asphalt which has been most widely exploited in the United States is that which comes from the Island of Trinidad. This occurs in a large deposit and has the valuable feature of being unusually uniform in quality. As mined it contains large percentages of water and of mineral matter in a finely divided state. There are also some soluble salts present in small quantity which possibly may help to explain the fact that it is acted upon by standing water, and is not suited for use in underground waterproofing and at points where it does not have a chance to dry out. This is not so serious a defect in a street pavement where the surface coating is made dense and where the pavement is covered by water for short periods only, although where depressions collect standing water deterioration soon results. Sunlight affects it somewhat, but it is not volatile in the atmosphere. Perhaps thirty per cent. may be considered as a fair average of the amount of flux necessary to add to it for the preparation of all asphaltic roofing cement. To prepare it for use the water and what vegetable matter may be present are removed. Over a third of the refined product is mineral matter.

Bermudez asphalt comes from Venezuela, is not quite so uniform as the Trinidad, and is softer than the other widely-known commercial solid asphalts. It contains but little mineral matter, but otherwise possesses many characteristics similar to those of the Trinidad.

In Colorado and Utah occur gilsonite and elaterite, which have some characteristics in common and which are often nearly pure bitumen. Gilsonite is hard and brittle, requiring considerable quantities of flux to make it available for use. It is not always uniform in its qualities. It is to some extent exported and is used for varnish. It is claimed as the base of many of the asphalt roofings, but is not a good saturant. Elaterite is more expensive, is softer than gilsonite, and is not found in such large quantities. Some manufacturers of roofing claim to use it. We have not heard of its having any special superiority.

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* Extract from the report of the Committee on Buildings of the American Railway Engineering and Maintenance of Way Association

Grahamite or "Choctaw," which comes from Oklahoma, is not much used for roofing. It does not dissolve readily in the ordinary fluxes, and in its physical characteristics is more like soft coal.

Southern California has deposits of asphalt of excellent quality, but their cost of mining, and the excellent character of the California oil residuals has driven them out of use. When California asphalt is mentioned the oil residuals are ordinarily referred to.

Rock Asphalt or Mastic Rock.—Sandstone saturated with bitumen is found naturally in various places in the country, principally in California. It is sometimes known as mastic rock, and is more valuable for paving and floors than for roofing or waterproofing, where it is rarely used.

Maltha.—Maltha, in this country found mainly in California, is a semi-liquid asphalt containing light oils which tend to evaporate upon exposure to the atmosphere, leaving what is practically an asphalt. It grades into the California petroleum and deposits are not extensive enough to be of importance commercially. There are underground deposits of this material so heavy that they cannot be pumped, and for which no practicable schemes of extraction has been devised.

Petroleum Residuals.—The petroleums found in the United States vary in quality according to their location. Hubbard* divides the important deposits into six fields, as follows:

Appalachian—From western New York through western Pennsylvania, eastern Ohio, north-western West Virginia into eastern Kentucky and Tennessee.

Lima—Indiana—North-western Ohio and eastern Indiana.

Illinois—South-eastern Illinois.

Mid-Continent—South-eastern Kansas, eastern Oklahoma and northern Texas.

Gulf—Louisiana and all of Texas except the northern portion.

California—Southern California.

The Pennsylvania oils are rich in the paraffines and in the lighter and more valuable illuminating oils and naphthas. Most of the California oils are practically free from paraffines and have comparatively small quantities of the illuminating oils. They are darker in color, have a greater specific gravity, and have what is known as an asphaltic base. The oils found in the intermediate fields have qualities varying between the two extremes in the order named.

Eastern oils are largely made up of compounds of the paraffine series. These vary in consistency from comparatively thin oil to hard scale paraffine. While most of the paraffine compounds are useless as binding materials, many of the fluid paraffines are excellent solvents for certain asphalts, and are in every way suitable for use as a flux. In the early days of the asphalt industry almost all the pavements were laid with an asphalt cement in which the refined asphalt was fluxed with a residuum high in paraffine, and the fact that these pavements gave excellent results shows that reasonable quantities of even scale paraffine are not necessarily destructive to the value of asphalt cements. The state in which the paraffine exists in an asphalt cement, *i.e.,* whether in complete solution or not, is of much more importance than the amount present so long as this is kept within reasonable limits.

The heavy residue from the distillation of the California oils is a substance with many of the desirable qualities of the best asphalts. The crude oil is distilled down to the required density and a product obtained with even and valuable qualities. Very large quantities of California oil asphalt have been used throughout the United States for paving and roofing purposes. Its use has not been at all confined to the Pacific coast. It is probably true that more asphalt roofing felt has been saturated with California oil asphalt than with any other kind of asphalt. This oil asphalt when melted becomes very liquid at comparatively low temperatures, and, for this reason, is especially suitable for saturating felt.

The heavy residuals of the Gulf, Mid-Continent, and Illinois petroleums are used in large quantities as substitutes for asphalts, frequently under that name. They are ordinarily less expensive than the natural asphalts. As compared with the California residuals, they contain more paraffine, are lower in ductility and adhesiveness, and, except that some of the residuals of the Texas oils are very stable, are in most ways inferior for roofing. Sometimes they are used as adulterants with better materials. To make them more stable and less affected by heat and cold, air is blown through them while hot. This reduces their ductility and adhesiveness, as well as their susceptibility to temperature changes. The blown oils are not as good saturants as an untreated residual, but for the protective coating of ready roofings they have considerable value, as they are stable and are not readily affected by the heat of the sun. They are not selected for stone-surfaced roofings because of their lack of adhesiveness.

THE TARS.

Coal Tar.—From the distillation of bituminous coal, either in a plant for the production of illuminating gas or in a by-product coke oven the products may be roughly divided into four classes, the gas, the ammoniacal liquor, which is the scrubbing water with the materials which it has absorbed from the distillates and which it holds in solution; the coal-tar, a heavy liquid containing the distillates insoluble in water which have settled away from the ammoniacal liquor and the coke.

The coal-tar contains some water, various impurities, and free carbon, which, after the water has been removed, is ordinarily from five to thirty-five per cent. of the total. This is carbon formed by the cracking of the hydrocarbons and is in a very finely divided condition. The percentage varies with the method of manufacture. The distillates or bitumen are composed of hydrocarbons which have widely-varying melting points and degrees of volatility. These may be roughly classified into light oils, creosotes and pitches. The character of the tar varies with the coal used and the manner in which the process is carried on. The tar from each plant has its individual characteristics. The greater the heat, the more the hydrocarbons are cracked into their constituents and the greater the amount of free carbon and of gas found and the less the amount of coal-tar. By carrying the process to its theoretical limit the final products of distillation would be gas and carbon.

The question of the relation between free carbon and coal-tar is one of considerable importance. It is generally considered to be a valuable adjunct to roofing tars and pitches. Free carbon makes the material less affected by changes in temperature. Comparing two pitches of similar consistency at normal temperatures the one having the greater amount of free carbon must have to neutralize it a greater per cent. of the lighter, more elastic and to some extent more volatile hydrocarbons and less of the heavy pitches. When it is cold the pitch is less brittle and when it is hot it does not flow so readily because of the carbon present. Thus a tar of a given consistency may, notwithstanding the fact that it contains large quantities of an inert material, apparently have more life than another with less of the free carbon.

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* Dust Preventatives and Road Binders. Wiley & Sons. 1910.

To determine the probable action of any tar or pitch under different temperatures its percentage of free carbon must be known as well as its melting point. The free carbon does not interfere with the saturating power in felt, although it is liable to be largely deposited on the surface of the felt.

When coal-tar pitch is exposed to the weather there is found upon its surface a thin layer, hard and brittle, the residue after the drying out of the volatile oils. This acts as a sort of protective coating to what is underneath. As soon as it is disturbed, exposing fresh pitch, the process is repeated. High carbon tars seem to weather better than low carbon tars, the increased amounts of free carbon seeming to aid in the foundation of the skin or protective coating.

The amount of free carbon in the commercial product is often regulated by combining coke oven tar, which, because of the design of the stills, is low in free carbon, with gas-house tar. The coke oven processes, where much attention is given to the by-products, can be made very uniform. It cannot be said that gas-house coal-tar is better than by-product oven tar or vice versa.

The statement frequently made that tar roofing material suffers in quality because it has been robbed of constituents desired in the manufacture of chemicals is not true. The lighter constituents are distilled off to leave a pitch of a certain desired consistency. In this process air or steam is frequently blown into the still. This prevents the deposit of free carbon on the sides and bottom of the still, and to some extent aids the escape of lighter oils, which would otherwise be held in solution. These oils if present in the pitch would tend to gradually evaporate, making the pitch unstable. The other way to remove them is to use a heat where danger of damaging the tar exists.

Watergas Tar.—Watergas is made by passing steam over hot coke or anthracite coal, which, decomposing the steam, forms carbon monoxide and hydrogen. This does not possess sufficient illuminating power, and to enrich it there is added a gas produced from petroleum which leaves a tar often used in place of coal-tar. In the process which it undergoes the oil residues are so changed by the high heat as to lose many of their characteristics and to acquire some of those of the compounds found in coal-tar. Compared with coal-tar, its oils have less antiseptic properties. As obtained from the gas manufacturers it is thinner, containing more water, more light oils, and less of the pitches and no free carbon. It is distilled down and treated much as is coal-tar, and its pitch is very similar in appearance to that of coal-tar.

Watergas tar decomposes easier than coal-tar. It often contains some paraffine, though ordinarily not in sufficient quantities to affect the product. The crude watergas tar is also much more affected by water and is capable to a considerable extent of forming an emulsion with it. Good coal-tar is practically unaffected by water, and it deteriorates from the surface only. Oil tar products, like the oil fluxes used with asphalts, are liable to undergo chemical changes which may tend to make the entire mass hard and brittle.

Watergas is now made practically everywhere, and ordinarily mixed with coal gas. In one large plant from the same amount of gas the watergas produces about a third of the amount of tar that coal gas does. The coal gas, considering its by-products, is, under favorable conditions, the cheaper, but the watergas requires less of a plant and allows greater flexibility of operation. The prices of materials and the demand for coke affect the relative outputs. In the large plant previously spoken of the proportions of coal and watergas made vary between two and three of watergas to one of coal gas.

In the larger illuminating gas plants the two sorts of tar are generally separated, but in many of the smaller plants they are mixed together. There is no reason why they should not be kept separate, except for the cost of separate receptacles. In this country, the by-product oven and gas-tars, both coal-tar and watergas tars, are bought by a comparatively limited number of concerns who closely guard their processes. They compound the different sorts possessing varying characteristics, endeavoring as far as possible with their supply and their desire for maximum profits to meet the needs and demands of the consumer. The consumer in his ignorance does not know what he is getting and probably usually does not know what he needs. The detection of oil-tar in coal-tar products is a difficult and uncertain matter, especially when it is under twenty-five per cent. of the total. We are not sure that it has been proven that a reasonable amount of watergas tar seriously injures a coal-tar for roofing purposes, especially when used as a saturant, although it is generally in disfavor.

Not long since practically the only use of tar was for roofing and the entire supply came from the manufacture of illuminating gas from coal. The situation has been changed by the increasing supply from by-product ovens, by the manufacture of water-gas in large quantities, by the great demand for creosote oils and other by-products, by the use of coal-tar for waterproofing masonry, by its use for briquetting coal slack, and by its adoption for use as a road binder as a protection against the ravages of the automobile.

We would sum up the remarks on the bituminous materials as follows:

With skill in compounding, based on a thorough working knowledge of the materials used, asphaltic compounds can be prepared of natural asphalts and oil residuals with valuable qualities for many different roofing needs, whose durability under known conditions can be foretold with considerable accuracy. The same can be said, perhaps with more certainty as to results, of the different tars. Either can suffer from adulteration and poor preparation. Considering first-class materials the coal-tar is cheaper, more easily affected by temperature changes, and is not acted upon by water, nor is it liable to internal chemical changes.

From these compounds the only definite information that can be furnished by laboratory tests as to probable life and weathering properties is negative in its nature and quite inconclusive. Specifications to be enforced must include factory inspection and knowledge of materials used.

In preparing this information, we have had assistance from many sources. We are especially indebted to Messrs. Dow & Smith, Chemical Engineers, New York City. Dust Preventatives and Road Binders, by Prevost Hubbard (Wiley & Sons, 1910) gives a review of the different bitumens, with considerable information about them, which should be of value to all interested in the subject of roofing, though in some points his statements do not obtain general approval. The qualities essential to a good road binder are to a certain extent those valuable in a roofing material.

FELTS.

The felts used with almost all bituminous roofings play a very essential part in the final product.

The desirable qualities of the felt vary with the saturating material to be used. With asphalt, saturating power is the main desideratum. For coal-tar, which, under heat, is much more liquid, this quality is not so necessary. All must be strong enough to avoid damage in handling before saturation. The strength of the finished product is due to a great extent to the saturation.

The felts are mainly made of rag stock, which is chiefly cotton rags. Notwithstanding the statements of many manufacturers, all-wool felt is never used for roofing, because of its expense and because it would be too soft and tender to work. A certain proportion of wool rags helps to make a felt which is open and spongy with considerable saturating power. The best felts for saturation by asphalt rarely contain more than 25 or 35 per cent. of wool, and those for use with coal-tar contain much less. As ordinarily used the term wool-felt applies to a soft open felt, with very little wool in it.

Sometimes paper stock, which is ordinarily wood pulp, though it may contain an appreciable percentage of straw, is used in small quantities if the felt is getting too soft. It has practically no saturating power, but it can add to the cheapness of the material. If used in anything over two or three per cent. it is an adulterant to cheapen the product when it is made to sell roofing manufacturers, or to make it less absorbent, as in the case of slaters' felt or hard felt for making up into two and three-ply coal-tar felt.

The felt materials ordinarily come to the factory in large bales already sorted with fair accuracy, and are bought according to different grades. These are used together in varying proportions to get different results and to meet variations in the materials. But little sorting is done at the plant except to watch for specially undesirable constituents.

The methods of manufacture have a considerable effect on the quality of the material. The felt must be well beaten to avoid large lumps, which are sources of weakness. The felt is made on a machine similar to that used for making ordinary paper and variations in its operation determine the quality of the finished products.

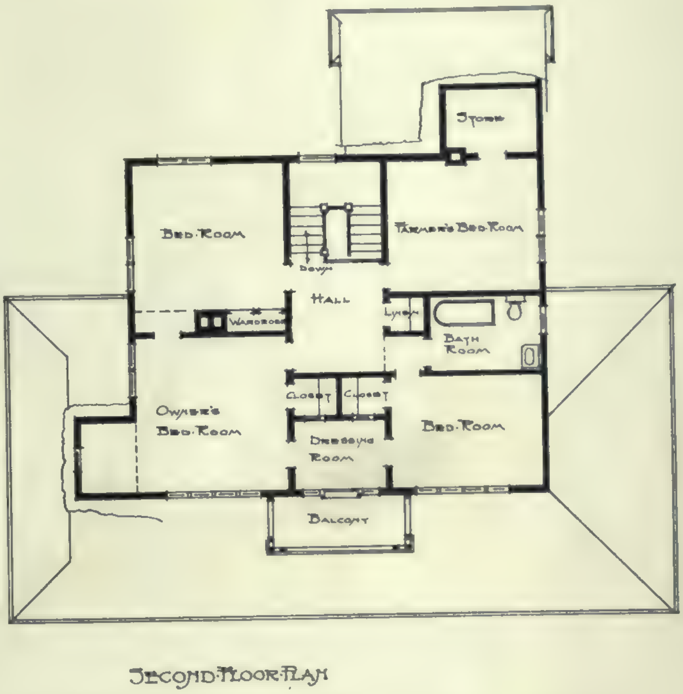
The dry felts are sold by weight. The standard is the amount which would lay 480 sq. ft. If a felt weighs 28 lbs. to 480 sq. ft., it is known as No. 28. For this reason felts sometimes have their weight increased by the addition of a mineral filler. This is nothing more than an adulterant which interferes with the saturating power. Some specifications which require a certain weight of felt get around such adulteration by requiring that the ash in the unsaturated felt must not exceed 5 per cent.

Felts of asbestos are used in one or two roofings. These are poor saturants and are more in the nature of protection to the asphalts. They will not burn or decay.

Jute woven in the form of burlap or canvas is used in some roofings to add strength. Its value is debatable. It is not a saturant like the felts and its fibers are not so thoroughly protected, making it liable on exposure to rot.

BUILT-UP ROOFS.

The main use of tar for roofing has been in the construction of built-up roofs, where layers of felt saturated with tar are nailed down, and by the use of a tar pitch protected and cemented together.



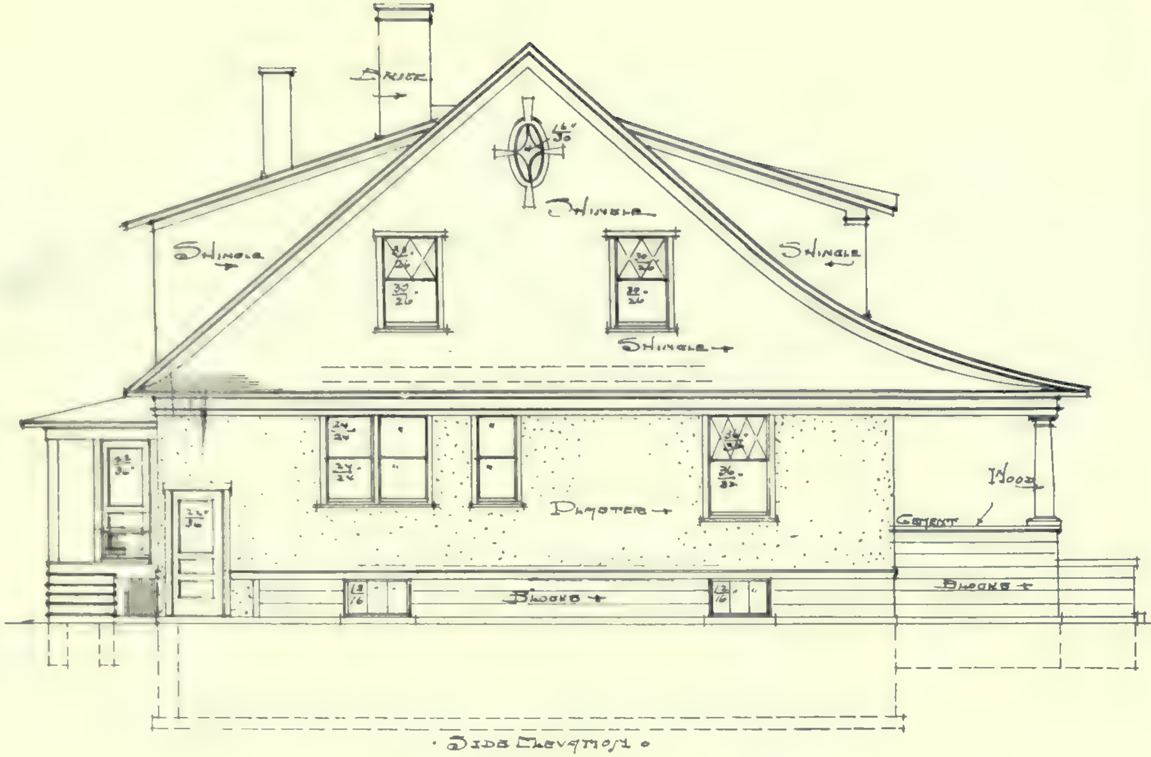
Second Floor Plan of Bungalow. Edwards & Saunders, Architects.
See page 165.

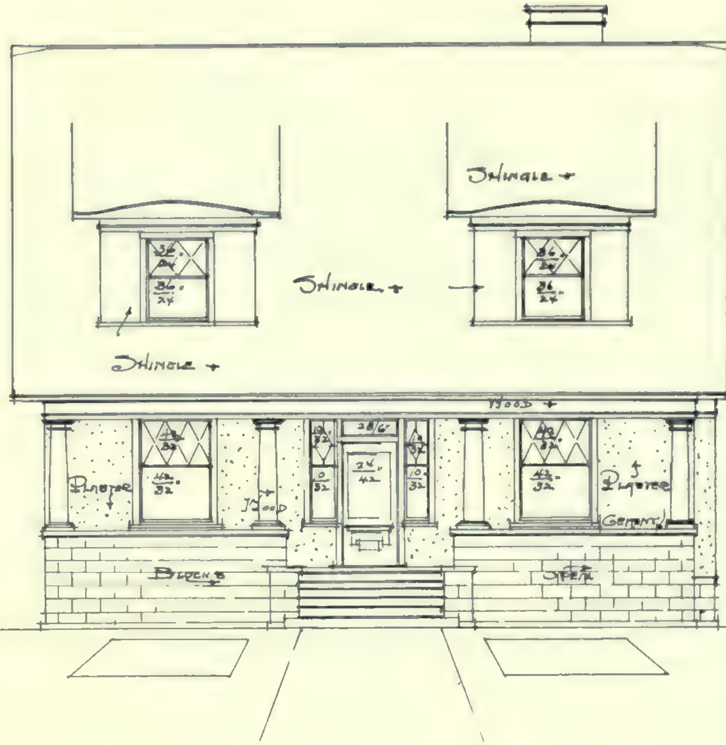
New Publications

HOW TO READ PLANS.—By Charles G. Peker. 104 pages. Size, 5x7½in. 81 illustrations. Bound in board covers. Published by the Industrial Book Company. Price 50 cents.

This is the second edition, revised and enlarged, of a little work which has been before the trade for several years, but in its present form will be found very useful to the young mechanic who is ambitious to advance in his chosen calling and acquire proficiency in the reading of architects' drawings. As the author aptly puts it, the best way to learn how to read a drawing is to learn how to make one, for any one who understands the art of drawing will naturally know the meaning of a drawing. The little work under review consists of a simple explanation of the meaning of the various lines, marks, symbols and devices used on architectural drawings, so that they can be correctly followed by the workman.

The present book is more than twice the size of the first edition and is comprised under 28 headings, the matter being accompanied by numerous sketches, plans, elevations, etc., all arranged in a way to be of the greatest possible use to those for whom the book is intended.





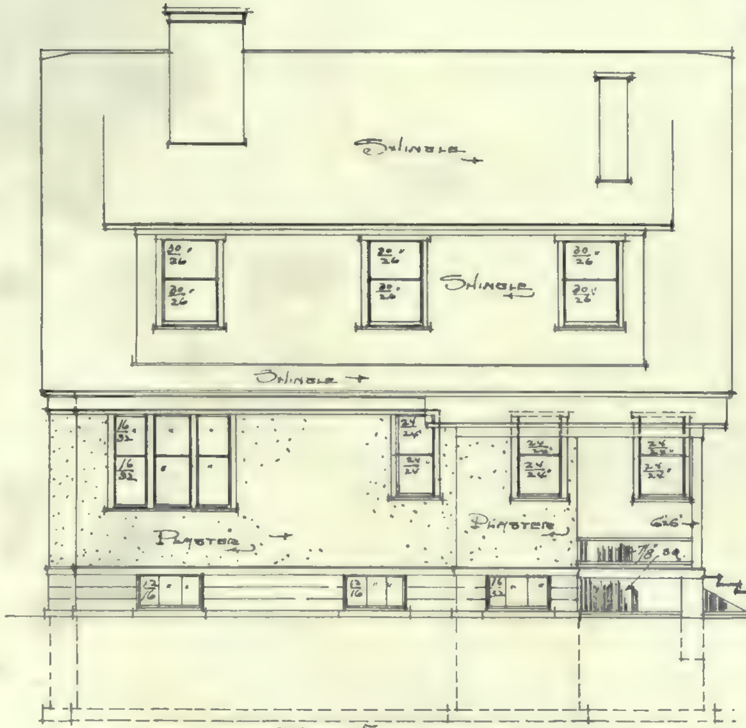
A Frame Bungalow with Cement Block Foundation

The plans illustrated this month are for a frame building of the bungalow type, with plaster exterior for the first storey and cement blocks for the foundation and porch walls.

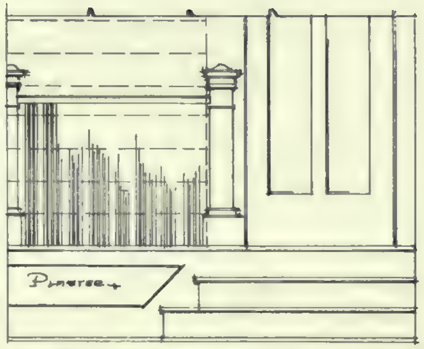
In applying the exterior plaster, first cover the studding with good sheathing, laid close and well nailed on each stud; then cover this with one thickness of heavy building paper, weighing about 1½ pounds per square yard. Next, the wood furring strips, about 12 inches on centres; then the metal lath, drawn tight and well secured with staples, which will extend through the furring into the sheathing. The plaster is applied in two coats, and in this house was finished with pebble dash, which is done by throwing pebbles into the cement before it is set.

A good exterior treatment would be to have the shingles in the gable ends stained a forest green, the roof shingles the same color, and all woodwork painted white or cream white. The sash and wood muntins which divide the upper sash into diamond shapes should also be painted white rather than black or green, as is often used. Low, sweeping roof lines add to the attractiveness of this home.

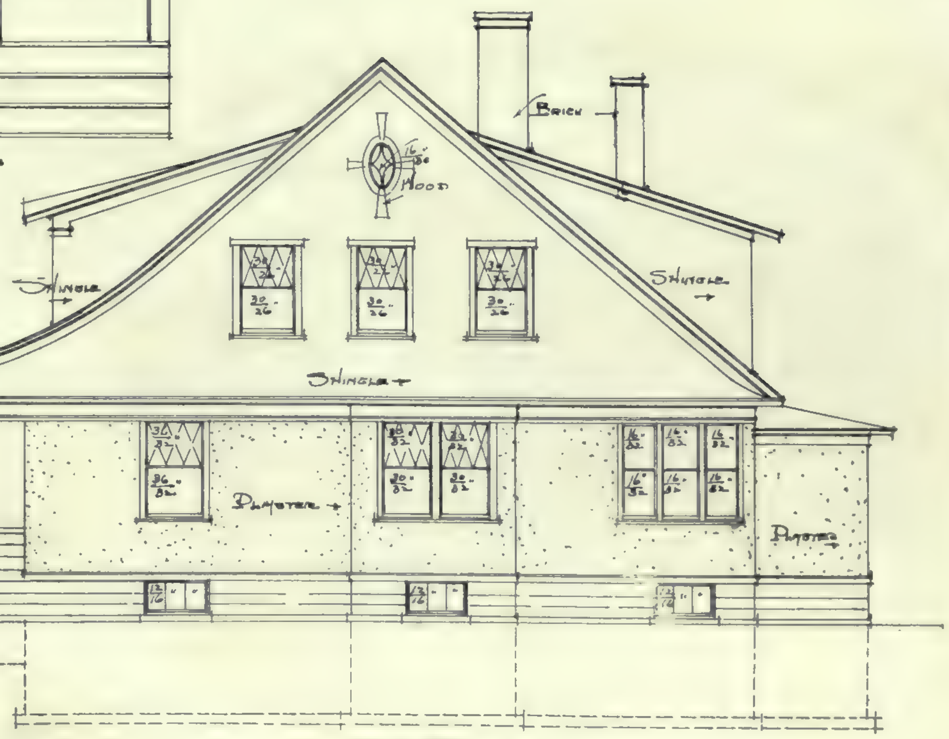
The size of the house on the ground is 33 ft.



Rear Elevation



Elevation of Stairs 3/4"=1'-0"



Side Elevation Scale 1/4"=1'-0"

6 in. by 38 ft. 6 in., exclusive of porches, and the front porch is 10 ft. wide.

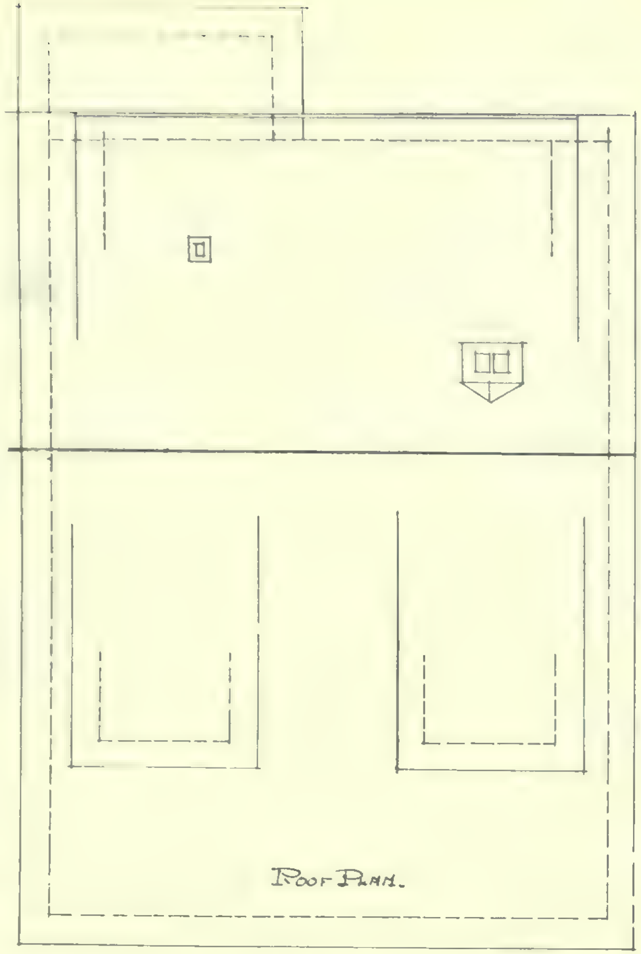
Entering the house through the vestibule is the reception hall, with a pretty stairway at the rear. This stairway arrangement is shown both by the floor plans and details.

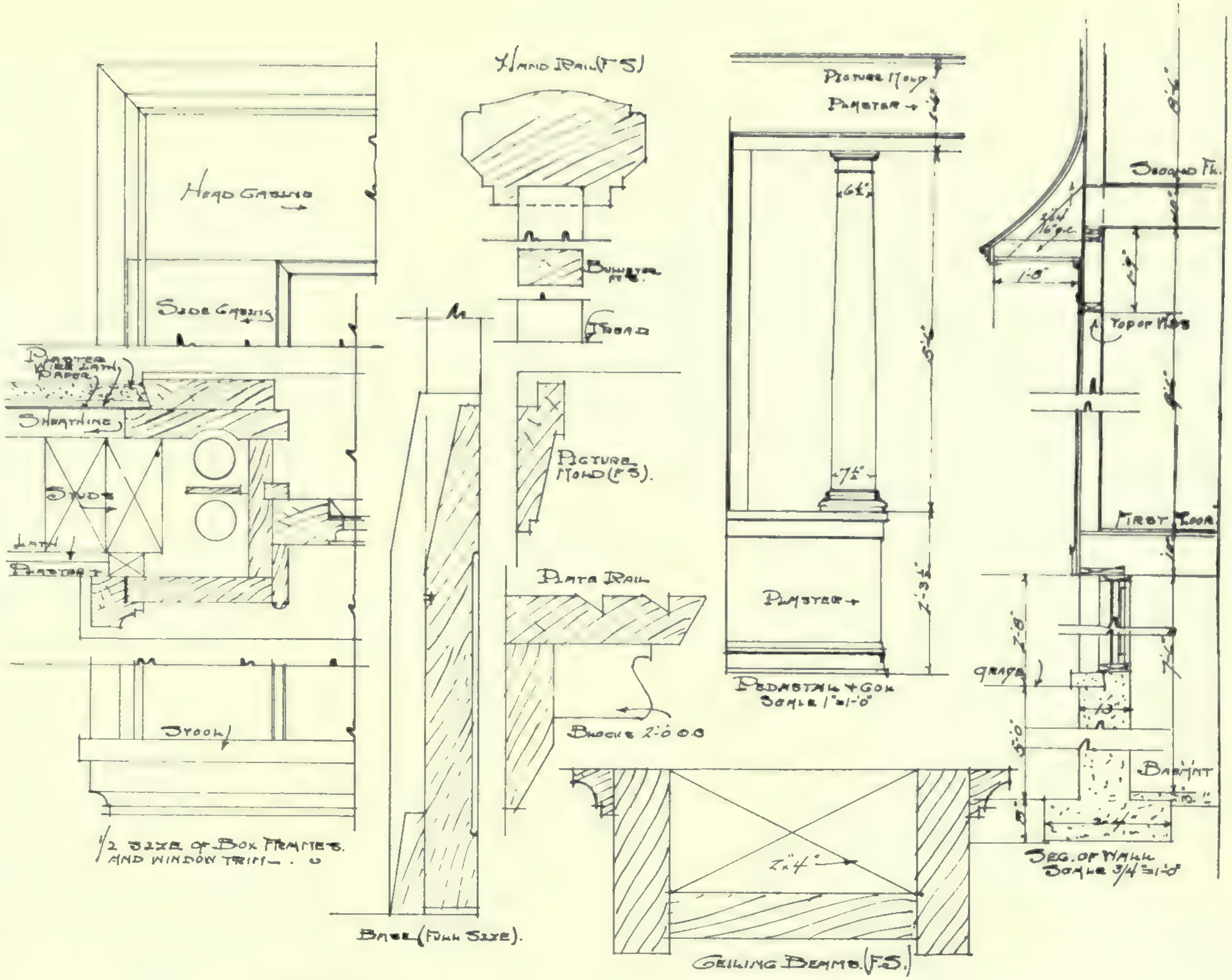
At the left of the reception hall is the dining-room, 12 ft. by 18 ft., which has a beamed ceiling and plate-rack, as shown by plans and details, and communicates with the kitchen through a good-sized and well-lighted pantry. Built-in cases and counter make the arrangement of this pantry complete and convenient.

The kitchen has a place for refrigerator near the rear entry, or the refrigerator could be placed in the rear entry if desired.

A grade entrance, which is shown by the side elevation and floor plan, leads to the kitchen and to the basement from the kitchen, or from out of doors.

On the opposite side of the reception hall is the





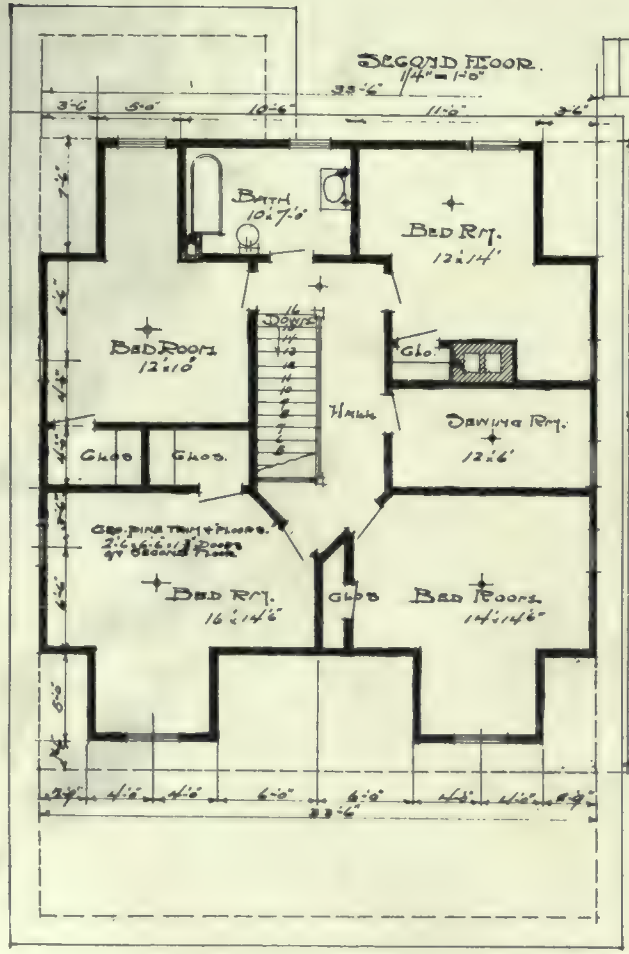
living-room, 12 ft. by 16 ft. 6 in., separated from the den at the rear by a wide opening, with colonial columns at each side. The broad, low fireplace in the den shows off well from the living-room and reception hall.

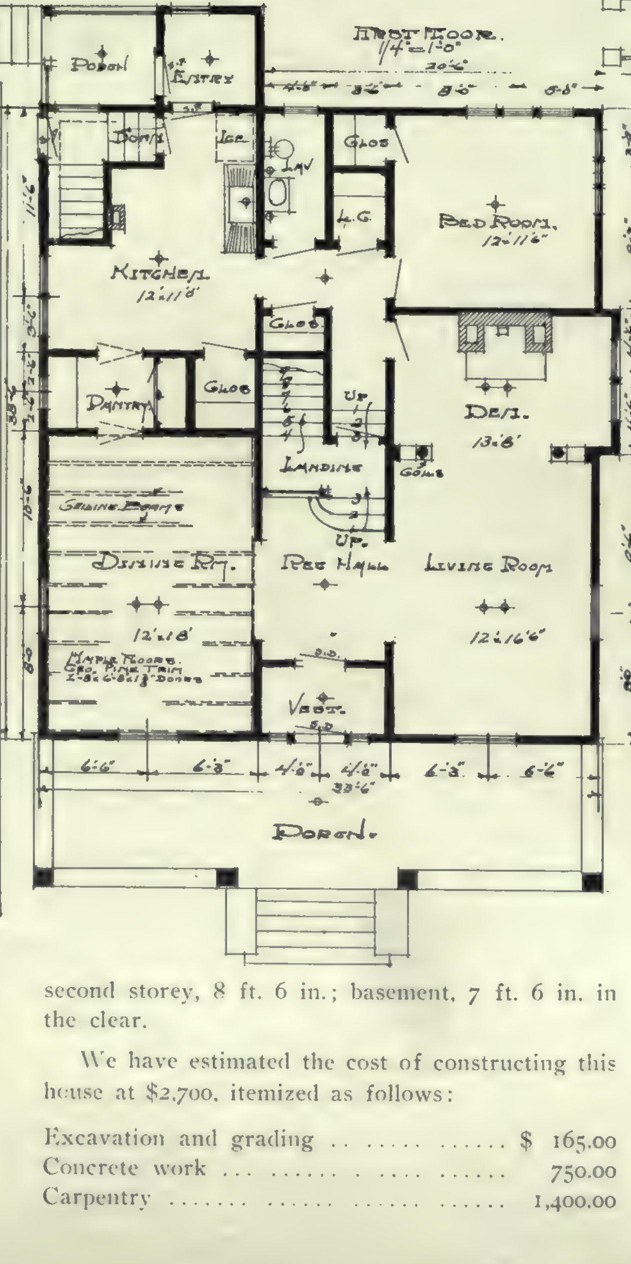
Back of the den, and reached from the rear hall, is a bedroom, 12 ft. by 11 ft. 6 in., with a convenient clothes closet, and is also near to the linen closet and lavatory.

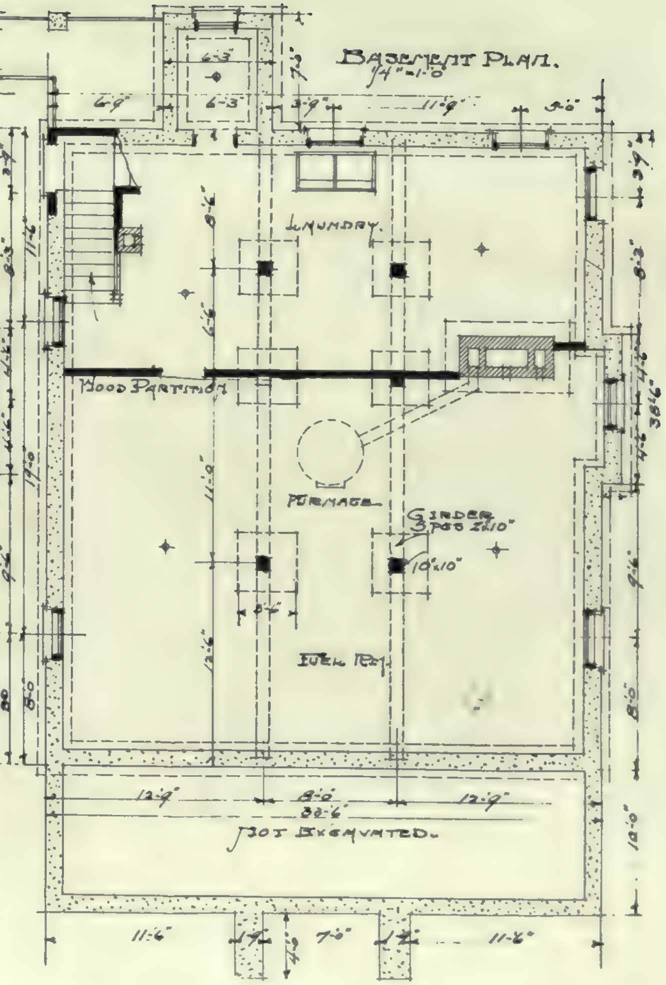
On the second floor are four good bedrooms and a sewing-room, 12 ft. by 6 ft. The irregularity of the bedrooms makes possible an attractive and cozy arrangement. All the rooms have separate closets, and are convenient to the bathroom, which is reached from the hall, near the head of the stairs.

The basement, extending under the entire house, is arranged for laundry and furnace and fuel-room, and has a cement floor throughout.

All the main rooms on the first and second floors have picture moulding, as shown by details.







It will be noticed that all the trim throughout is neat and plain, and the doors have two long, vertical panels instead of cross panels, to avoid the catching of dust.

Georgia pine is used for the trim throughout, and this makes a very good finish when stained and varnished.

Ceiling height of the first storey is 9 ft. 6 in.; second storey, 8 ft. 6 in.; basement, 7 ft. 6 in. in the clear.

We have estimated the cost of constructing this house at $2,700, itemized as follows:

Excavation and grading	$ 165.00
Concrete work	750.00
Carpentry	1,400.00
Brickwork	195.00
Fireplace	60.00
Interior and exterior plastering	375.00
Painting, varnishing and glazing	280.00
Heating	185.00
Plumbing	275.00
	$3,584.00

A Look Into the Preparation of Estimates

W. Fraser

Under this section we purpose to take into consideration the various difficulties, inconveniences and expense with which contractors are beset in all departments of the building trade, and to do our best to dissect and probe into any expense which may affect the cost of any work placed in the building. We do not expect our readers to always agree with us. We shall be sorry if they do. What we do hope, however, is to provoke some discussion, so that an idea of what may be styled Canadian practice may be outlined.—The Editor.

Shovel work will cost 20c. per c. yd.

Pick work will cost 27c. per c. yd.

We shall now consider that there is no chance of material being found in the neighborhood and dumped into the hollows free of expense. If such should be the case later we shall know just how much we shall be in pocket by the circumstance, and shall figure now on taking the material from the bank at the ¼-mile distance. We shall use carts to do the hauling and figure that each cart will draw in three loads (3 half-yards) an hour. We shall put six men to fill the carts, and a sufficient number of carts to keep the men going. The bank is about two-thirds of stiff clay, requiring picking, and we reckon our price thus:

Shovel work	20c.
Picking, 2-3 of 27c.	18c.
Cartage	21c.
Profit	6c.
	—
	65c.

Having already recorded in our notebook the quantity arrived at as per engineer's figures, we now enter it into our schedule in this form.

	Rate	$	Sum
Depositing stuff on site for leveling purposes			
Yards cube 463	*65c.*		

Having now placed the material in the hollows, in proper position, we shall now consider the leveling down of the hills. We shall figure on the plow and scraper rates and add an additional 3c. per yard for men's time trimming up the surface; and our price therefore is:

Plow work	5c.
Scraper work	11c.
Trimming	3c.
Profit	2c.
	—
	21c.

In our notebook we have the engineer's figures, and enter in our schedule.

Surface grading to the required level			
Yards cube 1715	*21c.*		

We now consider that the action of the weather and the traffic during building operations will bring the new surface to the proper degree of hardness, and conclude that by the methods we have adopted we have our price fixed on a fair basis.

For the purpose we have in view, and to be of interest to readers, we shall now suppose that some time after finishing the above work we receive a request from the architect for prices for an extension of the excavation, and in order to take in the view of that work in its various phases we shall follow them out ere proceeding with another department. It does appear that had we known of this proposed work at the same time as our surface grading we could have reduced our price on the hauling in matter. Yet it is not for the contractor to complain as to how or when works are let: it is his business to figure on what is set forth by the specification.

The projected works are largely trenches, pits, cellar work, and sewers. Before proceeding to do any further measuring and noting we must establish certain fixed principles, also certain signs to be used and their meaning. Our notes have to be *condensed, concise,* but *expressive,* so that if the plans are measured by our man his notes can be clearly understood and figured up by another. It is rather amusing to see the variety of signs in use now. Let us look into a few of them.

Six feet four inches.—Good plain English.

6 ft. 4 in.—Could not mean anything else.

6′ 4″—Used by architects; errors at times occur by its use.

Ft. ′ ″
6 4 0 —Good school method.

6.4—Engineer's sign, would read six decimal four ezuals $6\frac{4}{10}$ ft.

6—4 would read, 6 minus 4 equals 2.

In the fact of the existence of such a variety we will consider what is most suitable in our own case, and, though we pretend to know the value of the above, we are not at all anxious that our signs are understood beyond our own sphere, and we will be bold enough to establish our form thus 6^4, and say this means six and four-twelfths feet. Strong reasons will appear later for the adoption of this sign. If asked to note four inches, there it is 0^4. As other signs do not trouble us now we shall let them alone for the present.

As to the method of measuring, we have had trouble at times and been placed at a disadvantage on looking over our notebook by being unable to discern whether the figures we had put down represented length, breadth or thickness. This is a very important matter. Supposing we note a trench $4^0 \times 6^0 \times 10^0$, how, could we know the *length, depth* or *width,* except we wrote *in* these same words. Writing of words takes too much time and departs from the principle we have laid down, viz., "condensed, concise, but expressive." If the trench is 10^0 deep, 4^0 wide, 6^0 long, on principle the price would vary if it was 4^0 deep, 6^0 wide, 10^0 long, though the quantity would be the same. Therefore it is absolutely necessary that we establish a method from which we will not depart, unless in a specialized case. The method is this: The first measure we note is on a level line at right angles to the face commonly known as thickness or width. The second measure is on a plumb line from one point to another, commonly known as depth or height. These two measures, when multiplied together, give the superficial area of the section.

The third measure or measures (for there may be a number of them), when added together give what is known as length. When the total length is multiplied by the area of the section the product is the cubic contents. We will adhere to this principle in all departments where cubic contents have to be brought out.

Other departments not priced on cube quantities will receive due attention as we go along.

We now look up the specification and read "foundation trenches to be excavated to the depth shown, and to be two feet wider than the thickness of the walls; also that the trenches are to be refilled after the walls are built, the surplus stuff to be removed from site, and the ground trimmed off at completion." We look at the section and find that the width corresponds with that of the concrete footing, which is marked 4 ft. The thickness of the walls is also figured 2 ft; the depth from grade to bottom of footing is figured 6 ft. On the margin of our notebook we make a rough sketch of this section. It shows also that the concrete footing is to be 1 ft. deep.

When we figure out the section of the excavation of the trench and also the sections of concrete footing and wall within it, we find that 5-12 of the stuff to be taken out has to be left on the bank, and thereby the expense of haulage for that proportion of the whole will be saved. But when we find that refilling at walls properly rammed has to be done, and also trimming of the grade, we consider the difference of expense is about even, and we will now introduce the reader to our notebook, and make our notes on the

	EXCAVATION	
	Trenches	
	$4^0 \text{ x } 6^0 \text{ x } 70^0 + \underbrace{40^0 \text{ x } 2}$	
	$+ 78^0 + \underbrace{16^0 \text{ x } 2} + 72^0$	
	$+ \underbrace{6^0 \text{ x } 2}$	8256
A	$3^0 \text{ x } 4^0 \text{ x } 130^0 + 27^0 + 17^0$	2088
	Pits $3^6 \text{ x } 4^0 \; \underbrace{3^6 \text{ x } 20}$	980
	27	11324
		420

Let us go over the ground again. The 4^0 is the width of the trench, the 6^0 is its depth. The figures that follow are the various lengths, as we measure one after another, separated by the sign of addition + to show they are to be added together. It often happens that we get two or more measures the same length, and in such cases we write as we did at $40^0 \text{ x } 2$, using the sign of the invert arch to show that 2 is a number—not 2 feet. True, we had to add all those length measures together ere we multiply by the section. Why not put all those lengths down in our book under one another and then add them? The answer will appear later. This method must not be treated on algebraic principles; it is simply *our* method of noting.

As we went on we came across a different section of trench and we entered the notes at A, and also the pits. As this finishes the trenches and pits we figure out the different products and we know that such can be nothing else than cubic feet, and to save time in abstracting we simply add up and find the total cubic feet, and make the sign thus 27| , showing that we have divided by 27 and that the product is in cubic yards, which we will carry to our schedule.

We must be careful to underline heavily the limit of length measures connected with the particular section to which they apply, as shown in the above notes.

Now about our price.

(To be continued.)

Houses Two Thousand Years Old

Five fields of eight or ten acres at Meare, three miles north of Glastonbury, are being excavated for remains of lake dwellings. Under a layer of eighteen or twenty inches of mere deposit are found, on the older black peat, circular floors of clay about 27 feet in diameter. The walls of the dwellings were of hurdle work, plastered with clay, the whole structure supported by a central post of oak. A threshold of oak is generally found, and frequently small slabs of stone, arranged roughly outside the doorway.

In the Glastonbury lake village—probably of the same date as Meare—some three acres of dwellings and precincts were inclosed by palisading—piles of oak and alder, driven into the bed of the morass to keep back the waters of the lake. The hearths generally consisted of slabs of stone embedded in clay.

Relics found in these lake villages, which are perhaps from 1,850 to 2,100 years old, include:

Bones of infants; weaving combs of antler, often elaborately decorated; clay loom weights; bone shuttles; spiral bronze finger rings; bronze brooches; armlets of shale and beads of amber and glass; red coloring matter, suggesting the use of rouge.

Dice and dice boxes of stone; the spur of a fighting cock; remains of aquatic birds, including the pelican, which is no longer indigenous to Britain; iron snaffle bits and check pieces or horses' bits made of antler; iron horse collars, with iron rings through which the reins were drawn; pottery with curvilnear forms, zig-zags and dot-and-circle patterns; wooden tubs and wooden handles of saws and iron tools; iron saws, billhooks, knives, axes and adzes; crucibles; conical bellows tubes; querns for grinding corn.

Concrete Building Blocks

They Make a House That is Warm in Winter, Cool in Summer, Their Strength Increases With Age, and in the Last Analysis Houses Built with Them Cost Less Than Frame.

By Robert E. Havlik, M.E.

In speaking of concrete blocks I am touching upon a subject which has been hatched and rehatched many times over, and yet, in spite of all that has been said on this subject, we are learning so much more each year in the way of new methods of making concrete products that we wonder how we could begin to have been satisfied with the old methods which in the light of the present day appear so crude.

In discussing this subject I shall endeavor to confine myself to the essentials only and not burden you with minor details which you are familiar with.

I well remember the crude looking blocks exhibited at the Chicago Cement Show in December of 1906. Water, when poured on same was absorbed instantly. To-day as we inspect the products exhibited at our various shows we see an entirely different material, one that is dense, hard and waterproof. Five years ago the so-called concrete blocks were used in cheap buildings only, in foundations and underground. Only cast stone was considered for good work where a cut stone effect was desired. A gradual change has taken place since then, however, and the molded concrete block is now being used in some of the finest buildings. Cast stone is no longer as popular as it was then, not because it is not as good as the molded concrete block, but because the block can now be made as good as cast stone at a much lower cost, and since cost is always a prime consideration when the quality is the same, the molded concrete block is destined to play an important part in the building operations of the future. The best testimony we have of this is the magnificent buildings of the Barber Estate at Barberton, Ohio. These are being built of molded concrete blocks, made in standard machines and special wood and gelatin molds. When such men as Mr. Barber, who want a beautiful effect regardless of price, select molded concrete blocks in place of all other materials, there must be a great value in properly-made concrete blocks.

I am well aware of the fact that an immense amount of inferior work has been done in concrete blocks, but mistakes have been made in every new industry and it is but natural that mistakes were made in the concrete block industry. But we have passed the mere experimental stage of this industry and concrete blocks are now a staple building material, and if we continue to improve them in the future as we have done in the last few years, they will soon be in greater demand than any other one building material. Concrete blocks have everything in their favor. They make a house that is cool in summer and warm in winter, their strength increases with age, whereas, nearly all other building materials deteriorate with age, they can be made waterproof, and last but not least, homes built of blocks cost less in the last analysis than frame buildings because they require no repairs. But for this fact many a building now being put up of concrete blocks would be built of frame on account of the prohibitive cost of brick or stone. Thus the concrete block is improving the building construction of to-day both in beauty and permanency.

The concrete block is here to stay. The severe criticism to which it has been subjected in the past has resulted in the greatest possible good in that it has forced the block manufacturer to improve his product, and if we continue improving it as much in the future as in the past, we will soon place it beyond the criticism of its present severest opponent.

We can improve this industry best by paying more attention to the selection of the materials used and the methods employed in the manufacture of the blocks and placing on the market the best product we can make. The cement should be a Portland cement that will pass standard specifications. So much has been said about the proper selection of aggregates for concrete work, that I will not burden you with needless repetition any more than necessary. The most common aggregates used in concrete blocks are sand and gravel, although crushed stone is sometimes used in place of gravel and stone screenings in place of the former. There is considerable objection to both of these, however, especially the latter, on account of the crusher dust that is always present and clings to the stone particles and prevents the cement from properly bonding with same. It has been my experience that gravel and sand produce a denser and better looking concrete. In many localities, however, sand and gravel cannot be had except at prohibitive prices, whereas crushed stone may be very plentiful. In such cases there is no resource except to use this material. Whatever the materials, the finer, which is usually sand, should be well graded from ¼ inch to 1–50 inch or 1–100 inch. The coarse material should be well graded from ¼ inch to ¾ inch not to exceed 1 inch. The largest aggregate should never be larger than one-half the thickness of the thinnest wall of the block. Where a pit run of sand and gravel is used the material should range in size from 1–100 inch to ¾ inch. Both fine and coarse aggregate should be free from clay, dirt or fine dust, as these but tend to decrease the strength of the block. The water should be free from alkalies.

The next important consideration is that of proportions. There are three principal methods in vogue for determining the proper proportions, the "void" method, proportioning by trial mixtures and proportioning by a study of the mechanical analysis of the various aggregates. The first method is universally acknowledged to be little better than a guess, and has been discussed so frequently that I will pass it by without further comment.

For any given materials which are to be used in their natural state the second method of proportioning by trial mixtures will be found very satisfactory, but will not show what other changes in the sizes of the aggregate could be made. The procedure in this method is very simple. First get a good scale and a rigid cylinder, say a piece of eight-inch or ten-inch pipe twelve inches long or so. Weigh out and mix together carefully any arbitrary amounts of the cement, sand and gravel to be used and make the consistency same as that of the concrete to be used in the blocks. Place the mixture in the pipe, tamping same very carefully in thin layers. When it is in place note the height of same in the pipe. Then weigh out the same amount of cement as before, and the same total weight of sand and gravel, but vary the relative amounts, and repeat the operation using the same consistency as before. Note the height this mixture occupies in the pipe. That mixture which takes up the least space in the pipe is the best for those materials as they are.

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* Paper read at Canadian Cement and Concrete Association Convention. March [illegible]

The third method, while a little more difficult for the beginner, when once understood proves to be the simplest of the three. It permits of the immediate determination of the best combinations of raw materials in their natural state and also how they can be improved upon by adding or screening our certain size aggregates. In 1901 Mr. Wm. B. Fuller made an extensive series of experiments on the comparative strengths of different proportions of concrete aggregates. All the aggregates used were screened through various size screens after having been carefully mixed, and the percentages by weight of the materials passing screens of certain meshes were carefully recorded and plotted to curves with the distances on the vertical ordinates representing the percentage of weight passed through screens whose mesh is represented by distances along the horizontal lines or ordinates. He found that for any given amount of cement the strongest concrete was produced from that combination of aggregate whose mechanical analysis plotted to a curve as above, formed a parabola passing through the zero ordinates and the intersection of the diameter representing the largest stone and the 100 per cent. ordinate. This is discussed in detail in a special chapter by Mr. Fuller in Thompson & Taylor's treatise on "Concrete, Plain and Reinforced." The percentage by weight of the aggregate smaller than a given size can be easily calculated by the formula for the parabola—

$d = \frac{P^2 D}{10000}$ **or** $P = 100 \frac{d}{D}$ **in which** $P =$ **per cent. of mixture smaller than any given diameter.**

$d =$ **any given diameter.**

$D =$ **largest diameter of stone.**

From this it will be seen that the per cent. of aggregate smaller than a given diameter, say ½ inch and larger than a second diameter, say ¼ inch, is obtained by subtracting the percentage smaller than ¼ inch from the percentage smaller than ½ inch. The following table is figured out on this basis and shows the percentage of the various sizes for any given mixture up to 1 inch. Any block maker can screen out a sample of his aggregate through standard screens and carefully determine the percentages of various sized grains present and compare these with the theoretical percentages, and if he finds that he has too much coarse material he can screen out his coarse aggregate and recombine it with the fine in the proper proportions to correspond with the parabolic curve. He can do likewise if he has too much of the fine. This process is called rectifying the aggregates. I am afraid that some think that if an aggregate is graded to the parabolic curve that it will produce the strongest concrete with say 12 per cent. cement and no stronger than 20 per cent. cement be used. This is not true, for the strength will be increased with the increased amount of cement, but for any given amount of cement the strongest concrete will be from that aggregate whose mechanical analysis curve conforms very closely to a parabola. This probably holds true for concrete whose largest stone is ½ inch in diameter or larger. For mortar below number five mesh I think such an aggregate would have too much fine material. I have found the best result with a mixture of very coarse sand and a sand which is quite fine. (See table No. 1.)

I have dealt with this feature at greater length than I intended, but I feel that too much will never be said about the proper grading of materials for concrete blocks. I have seen too many blocks made with sand passing a No. 16 screen. The result was that the blocks were crumbly, soft, and a disgrace to the industry. What wonders the addition of a little coarse gravel would have accomplished! I have also seen some men insist on using fine stone screenings, the bulk of which was a fine flour with a little stone about 1–16 inch to ⅛ inch in diameter, simply because they heard that crushed stone produced a stronger concrete than anything else. It is our solemn duty to disseminate broadcast full information on the subject so that no man can have any excuse for using too fine an aggregate.

The selection of the aggregates and the proper proportions properly taken care of, the next important consideration is that of properly mixing the concrete. The superiority of machine mixing over hand mixing is an accepted fact and needs no argument. Mixers should be used by all means and none but power mixers. Hand mixers are man killers, as any one will testify who has used one. In choosing a mixer for concrete block work great care should be taken that it will mix semi-wet concrete and will handle either dry or damp materials. Every mixer will not do this, neither will every mixer that is satisfactory for a very wet concrete prove equally so for concrete used in blocks. It is an easy matter to mix concrete of the consistency commonly used in monolithic work, but that used in blocks, being drier, is far more difficult to mix.

Facing.

As nearly all concrete blocks are faced, considerable attention should be given this feature in their manufacture. Most blocks are sold on their appearance, so it is essential that the face be very hard and all corners and edges solid. For this reason it is necessary to use richer proportions for the facing than is used for the backing of the blocks. The usual proportions vary from one and one-half to three parts of the aggregate to one part of cement. When ordinary sand is used it should be graded from ⅛ inch down to No. 50 mesh with no material smaller than No. 100 mesh. The proportions can be as low as one part of cement to three parts of sand. But in white facing, the proportions must be richer as all available white aggregates are either all one size, as is the case in white sand, or contain too much fine material, as is the case in most crushed white marble. With some white sand and crushed white marble I obtained very satisfactory results with three parts white cement, two parts crushed marble and four parts white sand.

In colored facing none but mineral colors should be used. With proper materials and care, I have been able to use as high as 50 per cent. coloring in the proportions of one part cement, one-half part color and one part aggregate. Dark deep shades cannot be obtained except with a large percentage of coloring. Colored blocks and brick can be brought to a high polish by grinding. This process exposes the aggregate and produces a very attractive appearance.

A recent innovation is that of the granite facing. This is becoming very popular and is being used in large cities for public buildings for which the ordinary block would not be considered under any circumstances. I have found the best proportions for granite facing are one part of cement to two and one-half parts of granite. The granite should pass a ⅛ inch screen and be graded to about 1–32 inch. These facings comprise the principal facings used.

Process of Manufacture.

A few years ago the subject of considerable discussion amongst machine manufacturers was that of processes of making blocks. Each claimed that his was the only machine in which a wet block could be made and that no other was suitable for that purpose. The facts of the case are that as wet a block can be made on one machine as any other. I find that the limit is reached when the concrete is too wet to bear up its own weight. By this I mean that beyond a certain consistency the block will settle and instead of being 7¾ inches high it may be 7¼ inches in height. This fact then determines the maximum moisture that can be used in concrete for machine made products and will be the same for all makes of machines. It is evident, therefore, that there are but two processes for making concrete products, the poured or cast process and the molded, or so-called dry process.

In the poured process the concrete is of such a consistency that it can be poured into molds which may be of sand, iron, plaster of paris, or gelatin. There is no question but that the product made in sand molds is very beautiful, but its cost is so excessive as to be almost prohibitive. In some instances it was but slightly lower than cut stone. This fact is its greatest drawback and accounts for its decline in favor of the molded concrete block.

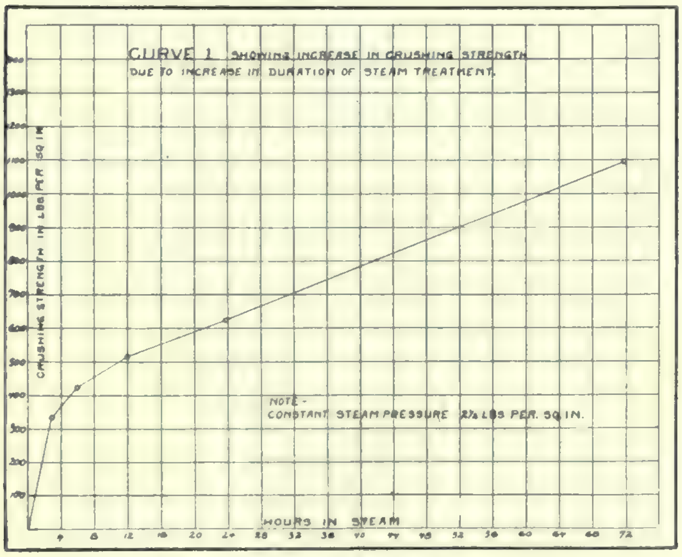


Diagram showing Increase in Crushing Strength, due to Increase in Duration of Steam Treatment.

In the molded process the concrete is made as wet as is possible to still permit of molding. It is then tamped or pressed into molds and usually removed immediately. The mold is thus used over and over again. This reduces the cost of the block to a minimum and enables the block manufacturer to compete with other building materials. Molded concrete is now being made as good as cast stone. This fact, combined with low cost, is bringing the concrete block to the front as one of the best building materials of the day. There has been considerable discussion as to the proper amount of water to use in concrete blocks. Most blocks are used when they are about twenty-eight days old so it is of the greatest importance to have the blocks as strong as possible at this age. Therefore, the consistency producing the strongest blocks at twenty-eight days is the best. Actual experiments show that blocks which show the highest crushing strength at twenty-eight days are those in which so much water has been used that it will flush to the surface when a pile of the concrete is trowelled with a steel trowel or shovel two or three times. This amounts to from eight to ten or eleven per cent. of the total weight of the dry materials. Concrete of this consistency is being used by the largest concrete block plants of the day. The well-known firm of Geo. Rackles & Sons, Cleveland, Ohio, make all their concrete consistency and mold all their stone in machines and special plaster, wood or gelatin molds. Their work is approved by architects everywhere and is the best argument in favor of the molded or so-called dry process of block making. Mr. Barber is using the same process in making blocks for all his buildings at Barberton, Ohio.

Waterproofing.

Many claim that the block made by the wet process is more waterproof, but I have seen blocks made wet in the molded process which were so waterproof that water would stand on same for a considerable time before being absorbed. Neither process will make concrete absolutely waterproof or nearly so. There are a large number of people who claim that a block with low absorption is all that is needed for practical purposes. This is true to a certain extent, but we must not forget that the average builder who is putting up a fine residence will not consider concrete blocks unless the manufacturer thereof will guarantee them to be absolutely waterproof or very nearly so, absorbing say not over one-half per cent. of moisture. I have done considerable experimenting trying to produce such blocks without the use of waterproofing, but have failed to do so. I do not think that it is possible to reduce the absorption below three per cent. without the use of a waterproofing. By the use of a waterproofing I have reduced it to 27–100 of one per cent. and I think that this absorption was merely due to the surface water on the specimen so that the block itself probably absorbed no water whatever.

I will admit that with proper care and graded materials concrete blocks can be made reasonably waterproof, but I contend that they are not waterproof enough, in that they retain moisture too long. We are all familiar with the looks of the average concrete block house after a rainstorm. It usually remains damp and dark-looking for two or three days, while one that is waterproof dries off in a few hours. Any man would prefer to live in a house that looked as dry a few hours after a rainstorm as before, rather than live in a building that remained a dull slate color for several days, so we should endeavor to turn out blocks that will give these results.

As long as blocks cannot be made as waterproof as this without a waterproofing, I will be in favor of the use of the proper waterproofing. I know well enough that a great number of waterproofings do not produce waterproof concrete, but there are also a number that do.

In testing a waterproofing, full-sized blocks should be made with same. Only such will be a reliable guide. Tests on small cubes are worthless as such specimens cannot be tamped nearly as thoroughly as a full-sized block, and consequently will not be as dense and waterproof. I have often noticed that waterproofing is confused with permeability. A block may be waterproof and yet be very permeable and vice versa. Waterproofing refers to the per cent. of water absorbed by a dry specimen in a given time, when placed under a pressure of water.

It is evident that the concrete block used above grade need not be impermeable but should be waterproof. A waterproofing may not produce an impermeable block and yet make a waterproof one.

In making white face concrete blocks it is absolutely necessary to use waterproofing, as the white aggregates that are most common consist of white sand which is very fine, and crushed marble or stone, none of which will produce waterproof concrete, the first because it is uniform in size and the second because it has too much flour.

Even assuming that concrete can be made waterproof with proper materials, the average man cannot get these and must make use of what he has, so it seems to me that the sooner the use of a good waterproofing becomes general the sooner will they overcome the objections of their present severest critics.

Curing.

When the question of aggregates, proportions and process of manufacture and waterproofing are settled, the next important consideration is that of curing the product. This feature is oftentimes neglected more than any other. The usual procedure is to sprinkle the blocks with water as soon as there is no danger of washing them away. When this is done the blocks should be kept moist constantly for a period of at least two weeks, but preferably four weeks. The temperature should be kept above the freezing point. There is no danger in keeping it too high, providing the blocks are kept wet constantly. If they are allowed to dry out, the hardening process is hindered. For this reason it is customary to keep the blocks under roof for three or four days at least, as it is much easier to keep them moistened under roof than outdoors. This method is extremely simple, so much so that it is surprising how few really apply it fully. I wish to emphasize the three essentials of this method. Commence sprinkling the blocks with a fine spray of water just as soon as you can do so without washing away the cement. Keep the temperature comfortable, say 60 °F. or more. Lastly, keep the blocks moist constantly for three or four weeks if possible. Many are doubtless mislead by the fact that blocks which are allowed to set until they show signs of drying out seem harder than those that were sprinkled as soon as they could stand the water. This is true at first, but after a few weeks the second block will be firmer than the first and have clean, hard, sharp cut edges.

It is conceded by all who are familiar with the hardening of Portland cement that it requires both heat and water to properly harden same. It is at once apparent that the ideal method of curing must therefore combine both of these features. The only thing that fulfills these conditions is an atmosphere of steam. We find many successful exhaust steam curing plants to-day, but in nearly all these the temperature is kept below 150° F.

Some five years ago, together with Mr. R. J. Wig, after having given this subject careful study, I felt confident that high-pressure saturated steam, which is also at a high temperature, would give the best results. If exhaust steam accelerates the hardening of the cement it is but a step further to assume that high-pressure steam will do so even more rapidly.

We put this theory to a thorough test and investigated both the effect on the crushing strength of concrete of variations in the steam pressure and also the duration of the steam treatment. We found that the crushing strength was increased directly with the duration of the steam treatment and also directly with the increase in the steam pressure. Concrete blocks cured in high-pressure steam will be doubled in strength over those cured by sprinkling. This means that in order to get the same strength in the block cured in high-pressure steam, only one-half the cement need be used. This probably holds true up to the point where the concrete would have so little strength when green on account of the lack of cement that it would crumble under its own weight.

I do know for a certainty that blocks can be made of one part of cement to three parts of coarse sand, which, when cured under high-pressure steam will crush at over 2,000 pounds per square inch of area.

A second advantage of high-pressure steam curing is that blocks so cured are ready for the market in two days. A third advantage is that rush orders can be filled as rapidly as the blocks can be made and without danger of breaking the edges of the blocks, which happens so often in handling them when they are but a few days old and cured by sprinkling.

A very important advantage is that blocks faced with white aggregate and ordinary gray cement, when so cured, will be practically as white as white face blocks. This is amply attested to by the samples which I have here.

An ordinary block made of one part cement and four parts sand will crush at about 1,800 pounds at six months, whereas, the same concrete when cured in high-pressure steam will crush as high as 4,900 pounds per square inch, thus showing over twice the strength.

A one-eighth mixture cured in high-pressure steam, crushes as high as 2,100 pounds per square inch, practically as high as the one-fourth air-cured concrete at six months.

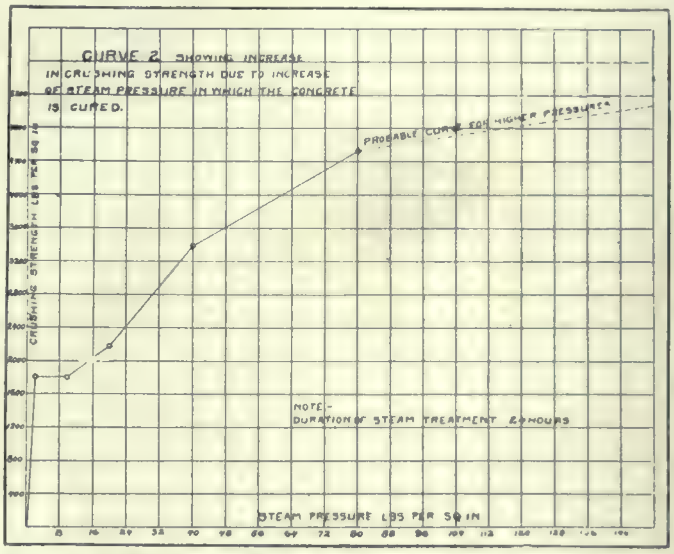


Diagram showing Increase in Crushing Strength, due to Increase of Steam Pressure iu which the Concrete is Cured.

Since nearly all blocks are used inside of twenty-eight days we are concerned with their strength at this age. Most building ordinances require a crushing strength of 1,500 pounds per square inch of net area of the blocks. If a one-eighth high-pressure steam-cured block will crush at 2,100 pounds, it stands to reason that the block maker need not use a one-fourth mixture as he must use in the air-cured blocks. He will, therefore, save about one-half of the cement.

The tables which follow and the curves drawn from same show the increase in strength caused by an increase in the steam pressure and also an increase in the duration of same. The tables are practically the same as those give in the July 1910 issue of "Cement Era." (See tables 2, 3, and 4), and curves 1 and 2.

Plant Arrangement.

When a manufacturer has decided upon the above essentials his next problem is that of arranging his plant. Every man will have his own views about this, but the following points should always be borne in mind when laying out any fair-sized concrete block plant.

The materials should be handled just as little as possible and the best way to do this is to have the raw materials enter the plant at one end and the finished product should leave the plant at another point, either to one side or directly opposite where the raw materials enter.

Whether the aggregate is hauled from a distance to the plant or comes directly from a sandpit at the plant, it should be stored in one end of the building, and if it is to be graded, it should be fed into a bucker conveyor which will elevate it to the overhead screens where the aggregate is then screened out into various sizes as desired and stored in overhead bins.

If the plant is not large enough to make it a paying proposition to put in screening machinery, the materials should be stored at one end of the plant just the same and fed from here directly into the mixer. From the mixer it should be hauled in a dump cart and discharged at the side or back of the block machines so as to be as handy as possible to the operator. The block machine should be located as closely as possible to the mixer so as to avoid useless carting of the concrete.

One man, with a system of this kind, can easily keep ten or twelve machines busy, whereas, without this arrangement it often necessitates the services of one mixer man to keep one or two block machines busy. The dump cart should preferably be elevated on a track, which arrangement makes it much simpler for the mixer man.

The block machine operator should use a shovel large enough to fill up the first part of the mold with one shovelful of concrete, and the second part with one or two shovelfuls of concrete. There is no excuse for any block maker using four or five shovelfuls of concrete to a block when he can do the same work with two or three at the most.

The blocks should be carried as short a distance as possible from the place in which they are made. The best arrangement is to have tracks made of two by four's placed directly in front of the block machine, leaving a space of three or four feet in front between the block machine and the racks. The usual length of such racks is from sixteen to twenty feet.

A twenty-foot rack will easily accommodate twenty-six 8x8x16 inch blocks, allowing 9 inches to each block. Four such racks can be piled one on top of the other and will accommodate 104 blocks. Four rows arranged like this will accommodate over four hundred 8x8x16 inch blocks.

With automatic tamping machinery and materials provided as above, one man will turn out regularly from four hundred to four hundred and fifty 8x8x16 inch common blocks per day or three hundred and fifty to four hundred faced blocks per day. All these are piled in a space about twenty feet long and not over seven feet in width. If exhaust steam is used for curing the blocks the curing room should be arranged so as to accommodate this number of blocks and partitioned off so that one set of blocks may be curing while another room is being filled with finished blocks.

Much has been said about the use of cars for racking concrete blocks. It is no doubt true that many manufacturers have found them to be a great advantage. On the other hand there are many large plants in which the arrangement is so simple that it is difficult to ascertain whether the use of cars would simplify matters or not. I have in mind the concrete block plant of the Menefee Art Stone Co., at Fort Wayne, Ind. Their arrangement is approximately what I have described above, and their men are actually turning out this number of blocks day after day.

After the blocks are cured two or three days, they can be piled up on trucks and removed to the storage yard where they should be sprinkled for a period of three to four weeks as described above.

Almost every concrete block manufacturer will manufacture a considerable amount of ornamental stone as well as caps, cornices, etc. In order to avoid confusion and also to produce this at the lowest possible cost, it is best to provide a separate place for the manufacture of these articles, entirely independent of the space used for making the regular blocks.

An overhead trolley should be provided for handling heavy stone. This will also be found a great convenience in loading the stone on to the wagons, as one to two men can easily handle the largest sills and caps with a hoist far better than half a dozen men can handle same by hand and with much less danger of breaking them.

Too much attention cannot be given to plant arrangement. A careful layout will enable the manufacturer to produce blocks at the lowest possible cost and hence increase his profits.

Cost of Concrete Blocks

The cost of concrete blocks is always a very important consideration, especially when it is necessary to compete with other building materials.

In a general address of this character, however, it is

Table showing quantities of sand and cement required per 100 blocks in sizes given below:—

SIZE OF BLOCKS	1-4		1-5		1-6		Bbls. Facing Cement	Output per day per man by hand labor
	Yds. Sand	Bbls Backing Cement	Yds. Sand	Bbls Backing Cement	Yds Sand	Bbls. Backing Cement		
8x 4 16 inch Solid	1.05	1.78	1.10	1.56	1.16	1.44	.375	135
8x 4 16 inch Hollow	.81	1.37	.85	1.21	.89	1.10	.375	172
8x 6x16 inch Hollow	1.11	1.88	1.17	1.66	1.22	1.51	.375	125
8x 8x16 inch Hollow	1.41	2.38	1.49	2.12	1.55	1.92	.375	100
8x10x16 inch Hollow	1.90	3.21	2.00	2.84	2.09	2.59	.375	74
8x12x16 inch Hollow	2.27	3.84	2.38	3.38	2.50	3.10	.375	61
8x 4x24 inch Solid	1.58	2.67	1.66	2.35	1.74	2.16	.562	89
8x 4x24 inch Hollow	1.10	1.86	1.16	1.64	1.21	1.50	.562	128
8x 6x24 inch Hollow	1.84	3.12	1.94	2.75	2.02	2.50	.562	78
8x 8x24 inch Hollow	2.19	3.70	2.31	3.28	2.41	2.98	.562	60
8x10x24 inch Hollow	2.73	4.62	2.88	4.09	3.00	3.72	.562	48
8x12x24 inch Hollow	3.27	4.62	.345	4.90	3.60	4.46	.562	41

impossible to cite cost data that will be applicable to any part of the country, as the prices of cement and aggregates vary so greatly.

The accompanying tables, however, will be found of great value in estimating the cost of the materials and labor, but will not include any overhead expenses, such as the salaries of the officers of the company and that of a salesman for disposing of the product. It will be noticed that the data as to the output per man on different sized blocks is figured on hand labor. Wherever a plant is equipped with power tampers, mixers, etc., the output per man will almost be trebled; in fact, in many cases it has been.

In general, any block manufacturer should make a gross profit of five cents per 8x8x16 inch block. By this I mean the profit above the cost of the materials and the actua labor of producing, curing and storing same. Out of this gross profit of five cents per block must be paid the salaries of the salesmen and officers of the company. It is, therefore, evident that where the output of a plant is low, that there must not be many officers or salesmen. A plant producing one hundred and fifty thousand 8x8x16 inch blocks a year should have a gross profit of $7,500.00. The salary of a salesman, who would in this case probably be the only officer of the company, may be $1,800.00 a year. The expense of additional office help may amount to $1,200.00 a year, making a total of $3,000.00. The net profit will, therefore, be in the neighborhood of $4,500.00 per year.

When one considers that the actual investment in a plant of this kind, including working capital, real estate and machinery does not run over from $5,000.00 to $7,000.00, it will be seen that the concrete block business is very profitable. There are many plants making from four to five times this amount year after year.

Strength of Concrete Blocks.

The use of concrete blocks has been restricted to a large extent in large cities on account of the fact that many city ordinances limit the use of eight inch blocks to buildings of but one story in height. This is due probably to the fact that the concrete block is a comparatively new building material and the average city authorities do not know much about the strength of same, and in order to properly protect their citizens against any inferior and untried building materials, they adopt measures which seem very harsh to those who are in a position to know about the strength of this splendid building material. There is no reason why concrete blocks should not be as strong as the concrete used in any monolithic work, and yet, we hear very little about the danger of monolithic concrete collapsing.

Reinforced concrete is used to-day in skyscrapers and all important buildings, for which purpose it has proved itself to be without a peer. The concrete building block is merely one peculiar form of this material, so in this respect it is really a tried and proven material.

In some cities where this question has been investigated, ordinances have been adopted requiring a crushing strength at 1,000 pounds per square inch, of gross cross sectional area of the block as it is used in the building.

Assuming a factor of safety of fire, which is greater than that used in steel construction, and which is an average used in other work, the allowable stress will be 200 pounds per square inch, of gross cross sectional area.

The distance of outside bearing walls of an average dwelling will not be over twenty-five feet nor will it be greater than this in the average store building. If the distance is any greater, then supporting pillars will be found between the bearing walls.

As an example, let us suppose that the distance between outside bearing walls is twenty-five feet and that the total floor loads including the live load and the weight of the floor is 110 pounds per square foot, and that the roof load including the weight of the roof, snow and wind loads is 57 pounds per square foot. These loadings are probably higher than what is found in the average building. One 8x8x16 inch block weighs about 50 pounds or 38 pounds per lineal foot. Per square foot of wall the weight of the wall will run about 57 pounds, therefore, the wall weight per story per lineal of wall will be 12x57 or 684 pounds.

For the sake of simplicity let us consider a strip between two such bearing walls, one foot long and twenty-five feet wide, or an area of twenty-five square feet. The floor loads, etc., will be carried by one foot of each side wall. The floor load per story per lineal of the two side walls is 25x110 pounds or 2,750 pounds. The floor load per story per foot of each side wall is one-half this amount or 1,375 pounds.

The weight of the wall per lineal foot of each side wall is 684 pounds making a total load per foot of each side wall of 2,059 pounds per story. An 8x8x16 inch block is 128 square inches. Assuming a safe loading of 200 pounds per square inch and a factor safety of fire, the allowable load on one 8x8x16 inch block will be 25,600 pounds. Per foot of wall this amounts to 19,200 pounds. This would allow nine and one-third twelve-foot stories to be carried by an eight-inch concrete block wall loaded as above.

It must also be remembered that a concrete block crushing at 1,000 pounds per square inch at twenty-eight days will probably have a crushing strength of 1,200 pounds per square inch at six months, so that the factor of safety at six months will be six instead of five. In view of these facts it is hard to understand why any city authorities should limit the use of an eight-inch concrete block to one story buildings only. They should at least be allowed in two story buildings, and if necessary the basement wall in such buildings could be made of ten-inch blocks. On this basis the actual factor of safety would be 4x5, or twenty instead of an apparent value of five.

It is true that some portions of a building will be loaded more heavily than I figured above on account of openings in the wall, but the openings are not likely to run over 25 per cent. to 33 per cent. of the wall area, so the actual factor of safety in any part of the building is likely to be at least twelve where it is allowable to use an eight-inch wall for two stories.

In steel work a safety factor of more than four is seldom required, so it certainly seems to me that any city authorities would be on the safe side if they allowed the use of eight-inch blocks in two story buildings, for they can safely figure that the actual safety factor in such cases will be twelve and this will continue to increase for the concrete will increase in strength the older it gets.

We should not feel that city authorities discriminate against the use of concrete blocks, but rather that the associations of cement users are at fault in not paying more attention to the drawing up of proper ordinances which can be presented to the various city authorities, and I heartily recommend, if this association has not already done so, that it take steps to draw up the proper ordinances that will be fair both to the block manufacturer and the user thereof, and figure the allowance for thickness of walls on a basis of the crushing strength of the blocks, and also limit the maximum loading to which any part of the wall may be subjected. Such ordinances should cover the method of manufacture as well.

It will be found that no ordinances can cover all buildings especially factories and warehouses. In such cases the size of the pilasters and bearing walls must be figured according to the actual load to be carried by same.

While I do not expect all my hearers to agree with my views, I sincerely hope that some of the points that I have brought out have proved of interest.

Table showing quantities of sand and cement required per 100 blocks in sizes given below:—

TABLE 1—This table shows the percentages by weight of any size aggregate required for an ideal mixture the largest aggregate of which corresponds with one of the sizes given below. For example, if the largest stone is one inch in diameter the percentage of each of the other sizes is found in column 3. The material smaller than .015 inches includes the cement. This data is figured by the formula $P = 100\sqrt{\frac{d}{D}}$ as explained above:—

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Diameter of Stone in inches	% Smaller than Diameter to left.	% Between dia. to left and next larger dia.	% Smaller than diameter to left.	% Between dia. to left and next larger dia.	% Smaller than diameter to left.	% Between dia. to left and next larger dia.	% Smaller than diameter to left.	% Between dia. to left and next larger dia.	% Smaller than diameter to left.	% Between dia. to left and next larger dia.	% Smaller than diameter to left.	% Between dia. to left and next larger dia.	% Smaller than diameter to left.	% Between dia. to left and next larger dia.	% Smaller than diameter to left.	% Between dia. to left and next larger dia
1.00	100.0	0.0														
.75	86.5	13.5	100.0													
.50	70.6	15.9	81.6	18.4	100.0											
.30	54.7	15.9	63.3	18.3	77.5	22.5	100.0									
.25	49.9	4.8	57.7	5.6	70.6	6.9	91.4	8.6	100.0							
.20	44.7	5.2	51.6	6.1	63.3	7.3	81.6	9.8	89.5	10.5	100.0					
.15	38.7	6.0	44.7	6.9	54.8	8.5	70.6	11.0	77.4	12.1	86.5	13.5	100.0			
.10	31.6	7.1	36.5	8.2	44.7	0.1	57.7	12.9	63.2	14.2	70.6	15.9	81.6	18.4	100.0	
.05	22.3	9.3	25.8	10.7	31.6	13.1	40.8	16.9	44.7	18.5	50.0	20.6	57.8	23.9	70.6	29.4
.02	14.1	8.2	16.4	9.4	20.0	11.6	15.8	15.0	28.3	16.4	31.6	18.4	36.5	21.2	45.7	24.9
.015	12.2	1.9	14.2	2.2	17.6	2.4	22.3	3.5	24.5	3.8	27.4	4.2	31.6	4.9	38.7	7.0
Smaller than .015		12.2		14.2		17.6		22.3		24.5		27.4		31.6		38.7
Total		100.0		100.0		100.0		100.c		100.0		100.0		100.0		100.0

TABLE 2—This table shows the effect of the duration of steam treatment on the crushing strength of concrete. Proportions of the concrete are: One part Portland cement, three parts sand, four and one-half parts gravel.

Curing Treatment	Crushing strength in lbs. per sq. in. at 2 and 3 days	7 days.
Not steam cured but sprinkled for 1 week.		379
Steam cured at 2½ lbs. steam pressure for 3 hours.	334	341
Steam cured at 2½ lbs. steam pressure for 6 hours.	427	484
Steam cured at 2½ lbs. steam pressure for 12 hours.	517	750
Steam cured at 2½ lbs. steam pressure for 24 hours.	627	660
Steam cured at 2½ lbs. steam pressure for 72 hours.	1095	1167

TABLE 3—This table shows that the crushing strength obtained by steam curing is permanent. Proportions: one part Portland cement, three parts sand and four and one-half parts gravel.

Curing Treatment	Crushing strength in lbs. per sq. in. at 2 and 3 days	7 days	28 days	3 mos.
Not steam cured but sprinkled for 1 week.		397	1068	1426
Steam cured at 2½ lbs. for 24 hours.	627	660	1382	1488
Steam cured at 2½ lbs. for 72 hours.	1095	1167	1270	1522

TABLE 4—This table shows the increase in crushing strength of concrete caused by the increase of steam pressure in which same is cured. Proportions: one part Portland cement to four parts sand.

		Steam cured at	
	2 lbs. for 24 hours	10 lbs. for 24 hours	20 lbs. for 24 hours
Crushing strength in lbs. per sq. in. at 2 days	1815	1800	2184
		Steam cured at	
	40 lbs. for 24 hours	80 lbs. for 24 hours	80 lbs. for 12 hours
Crushing strength in lbs. per sq. in. at 2 days	3396	4520	2540

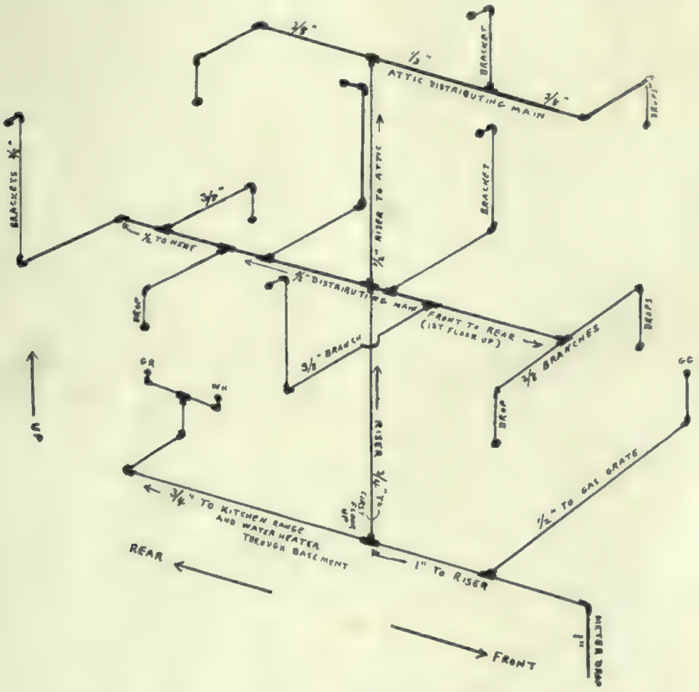
Specifications for Modern Gas Piping

By George W. Allen, Toronto

In order to obtain the best possible service from the use of gas and gas appliances, it is absolutely essential that a proper system of gas piping be installed in all classes of buildings. Builders, home owners, and pipe fitters will find the following tables and diagrams, also specifications, of value when laying out a piping system:

GENERAL CONDITIONS.—The gas fitting installation must conform to the general rules and regulations of the gas company supplying the district in which the building is located with gas. The plumbing contractor shall pipe the whole building for gas in the most approved manner, and all his work must be in strict accordance with the following detailed specifications. The whole piping to be completed before plastering is commenced.

PIPES.—Best quality wrought iron welded gas pipe of sizes to conform to the scale given below shall be used. All pipe to be free from splits, flaws or other defects, and to be of a true and uniform section. (State if pipe is to be plain wrought iron or galvanized.)



The above illustration shows a proper laid out system of gas piping. See how evenly it is distributed.

FITTINGS.—All fittings, such as sockets, elbows, bends, tees, crosses, reducers, etc., under two inches diameter shall be extra heavy malleable iron fittings, fittings of larger diameter to be cast iron fittings. (State if fittings are to be galvanized or plain.) Galvanized fittings are preferred; the coating of zinc, if properly applied, effectually covers up all blowholes, etc.

JOINTS.—All piping and fittings are to be put together with screw joints and red lead, or red and white lead mixed. All joints to be perfectly gas tight. The use of gas-fitters' cement in the making of pipe joints will not be permitted. Care must be taken not to put too much white or red lead in the fitting or on the pipe, which, when pipes are screwed together, might obstruct the clear bore of same.

SIZES OF PIPES.—All rising and distributing pipes and all branches to bracket and centre lights shall be of ample and sufficient size to supply the total number of burners indicated on plans. In determining the sizes of pipes do not confound outlets and number of lights. The pipe should correspond to the greatest number of lights or burners it supplies irrespective of the number of outlets. No pipe shall be less than ⅜ inches in diameter, and this size shall be used only for not more than one or two bracket lights, or for three or four-arm chandelier. The gas-fitter shall proportion the sizes of risers, distributing lines and service branches by the following scale for gas piping. The accompanying diagram gives a proper layout for a moderate sized house. Stores, factories, warehouses, and public buildings should also have a proper layout, and all branches, risers, and mains evenly distributed.

Size of Pipe Inside dimension	Greatest Length Allowed	Greatest Number of ⅜ in. Openings
⅜ inch	20 feet	1 opening
½ "	30 "	2 "
¾ "	60 "	10 "
1 "	70 "	15 "
1¼ "	100 "	25 "
1½ "	150 "	50 "
2 "	200 "	100 "
2½ "	250 "	200 "
3 "	300 "	350 "
4 "	450 "	450 "

Rising main from basement to second floor to be in no case less than ¾-inch.

Pipe supplying gas range and water heater in kitchen to be in no case less than ¾-inch. Pipes supplying gas grates must be ½-inch. Fixture and bracket outlets are not to extend out more than 2 inches beyond plaster. If combination fixtures, do not extend outlet beyond plaster more than 1 inch.

All branch pipes running to outlets to be rigidly installed. This will prevent the branch moving out of place in case it is required to remove drop.

It is also preferrable to have a fixture board set in between joists and nearly on a level with laths to insure non-shifting of outlets.

No gas pipes to be placed at the bottom of floor beams, which are to be lathed and plastered, where they would be inaccessible in case of leaks or alterations. All piping is, as far as practicable, to be laid so as to be got at in case of repairs.

Where gas pipes under floors run across wooden beams the latter are to be cut, notched, or bored at no greater distance than two feet from their bearings, and on no account shall pipes be let into beams more than two inches in depth.

All pipes shall be run as direct as possible, and with a true grade and fall toward the rising lines and the gas meter, so as to prevent the accumulation of condensed vapor or water and consequent trapping.

Where needed special drip-pipes, closed tightly with screw plugs, must be provided. Long runs of pipes are to be firmly and rigidly supported, at short intervals, to prevent the pipe sagging in the centre and becoming trapped by water from condensation.

PRESSURE TEST AND INSPECTION.—When piping is completed, and before plastering is commenced, all gas outlets shall be tightly capped, and the whole system of gas piping shall be tested by a low pressure spring gauge or, better, a mercury gauge and force pump, and proved to be air and gas tight under a pressure of air that will raise the column of mercury eighteen inches in the glass tube, equal to nine pounds pressure per square inch. The system of piping is to remain under pressure at least one hour. Any leaks indicated by the falling pressure indicated on the gauge are to be immediately stopped.

Points on Electrical Wiring

We Might Point Out That We Are At All Times Ready to Answer Any Questions With Reference to Wiring of Buildings or Allied Work.

The electrical department of the Canadian Fire Underwriters' Association, from time to time, issue bulletins to the electrical trades in respect to wiring. These bulletins are practically building by-laws for insurance purposes.

Their latest one with respect to putting up lighting fixtures affects all builders and house owners. It rules as follows:

Regarding the installation of electric fixtures, we beg to draw your attention to some of the most essential requirements in connection with fixture installations, and also to notify you that where the following rules are violated, we will be unable to issue a certificate, if called upon to do so, and in the absence of any notice from the contractor or the parties who have installed fixtures, the defective work will be brought to the attention of owners of buildings.

Owing to the enormous increase in the use of electric light, together with the still greater increase which will inevitably follow, a rigid standardization of fixture work is obvious.

The receipt of this notice must not be construed as an acceptance of any defective work which may be discovered, which may have been installed previous to the receipt of this notice. The rules governing the installation of electric fixtures are known to all first-class electric wiremen and contractors and have been printed in the various editions of the National Electrical Code, a liberal supply of which has always been distributed amongst the electrical trade and others interested. As, however, inspectors are constantly met with the argument that certain things were not known to the wiremen, who may have violated the Code, we are adopting this means of bringing some of the rules to your attention so that there can be no lack of information on this point, and the following rules cover the most essential features in connection with fixture work, viz.:

1.—The proper making, taping, and soldering of joints is a rule well known to any electrical wireman, and will of course be required in all cases.

2.—In all cases where fixtures are attached to gas pipes, or any grounded metallic support, they must be furnished with approved insulating joints.

3.—The use of so-called flat canopies, that is to say, plates or flat canopies where the wires are jammed hard together or against the wall or ceiling to which the fixture is attached, will not be accepted.

4.—All fixtures whether electric or combination must be provided with canopies which will allow plenty of room in which to enclose the joints without crowding.

5.—Where straight electric fixtures are attached to outlets, which are already piped for gas, they must be attached by means of approved insulating joints. The practice of screwing crow foots over the ends of gas pipes is not approved and will not be accepted, unless a turned wooden block at least ¾ in. in thickness is first of all screwed to the wall or ceiling which will effectually cover the end of the gas pipe, which must not project through the block, and this block must be at least of the same outside diameter as the fixture canopy.

6.—All fixture wires inside the arms and stems of fixtures must have the joints soldered and taped in the same manner as applies to other conductors.

7.—In all cases approved fixture pads must be provided where fixtures are located on brick walls, walls of fire-proof buildings, metal or plaster partitions where metal lath is used.

All the foregoing requirements are required by the National Electrical Code and it is necessary for the protection of our interests, as well as those of the general public, that these requirements be rigidly observed.

Questions and Answers on Electrical Wiring

Question.—Why do fire underwriters require not less than No. 12 wire in services for a small house?

Answer.—Because No. 14 is the smallest size allowed inside, and it is a good precaution to prevent undue drop in voltage, and then there is always the likelihood of increase afterwards.

Question.—Why do fire underwriters charge a fee for inspecting wiring?

Answer.—Because every architect's specification in America requires a certificate of inspection, and all the insurance companies require that electric wiring be up to underwriters' rules, and the fee is good value to any one. The underwriters render a valuable service for a fee that is only nominal, and when they issue a certificate it prevents any dispute between the company and the assured. If the assured allow current to be used with defective wiring they lay themselves open to complications in case of fire loss.

Question.—Why cannot I bush a wire where it passes through the floor with flexible loom instead of porcelain tube?

Answer.—Because Code requires porcelain as tubing absorbs moisture.

Question.—Why do underwriters' rules call for not less than No. 14 wire, even if feeding only one light, when No. 14 will carry twelve lights?

Answer.—Because No. 14 is considered to be mechanically as small as it would be advisable to use, and any smaller would not stand mechanical strain and would be loose in most of the fittings and supports. It is conceded by all authorities to be the best minimum size to allow.

Specifications for Felt, Pitch and Gravel or Slag Roofing Over Boards

The Following Specification Gives What is Considered as Good Practice in the Construction of a Flat Built-up Roofing on a Wooden Sheathing.

Incline—

This specification should not be used where roof incline exceeds three (3) in. to one foot. For steeper inclines modified specifications are required.

SPECIFICATION.

Roofing—

First, lay one (1) thickness of sheathing paper, or unsaturated felt, weighing not less than five (5) lbs. per hundred (100) sq. ft., lapping the sheets at least one (1) in.

Second, lay two (2) plies of tarred felt, weighing fourteen (14) to sixteen (16) lbs. per hundred (100) sq. ft., lapping each sheet seventeen (17) inches over the preceding one, and nail as often as is necessary to hold in place until remaining felt is laid.

Third, coat the entire surface uniformly with straight run coal-tar pitch.

Fourth, lay three (3) piles of tarred felt, lapping each sheet twenty-two (22) in. over the preceding one, mopping with pitch the full twenty-two (22) in. on each sheet, so that in no place shall felt touch. Such nailing as is necessary shall be done so that all nails will be covered by not less than two (2) plies of felt.

Fifth, spread over the entire surface a uniform coating of pitch, into which, while hot, imbed not less than four hundred (400) lbs. of gravel, or three hundred (300) lbs. of slag, to each one hundred (100) sq. ft. The gravel, or slag, shall be from one-quarter (¼) to five-eighths (⅝) in. in size, dry and free from dirt.

Flashing—

Flashings shall be constructed as shown in detailed drawings.

Labels—

All felt and pitch shall bear the manufacturer's label.

Inspection—

The roof may be inspected before the gravel or slag is applied by cutting a slit not less than three (3) ft. long at right angles to the way the felt is laid.

N. B.—To comply with the above specifications, the materials necessary for each one hundred (100) sq. ft. of roof are approximately as follows: 11 sq.ft. sheathing paper, 80 to 90 lbs. tarred felt, 120 to 160 lbs. straight run coal-tar pitch, 400 lbs. gravel, or 300 lbs. slag.

In estimating felt, the average weight is practically 15 lbs. per 100 sq. ft., and about 10 per cent. extra is required for laps.

In estimating pitch, the weather conditions and expertness of the workmen will effect the amount necessary for the moppings, and to properly bed gravel or slag.

The sheathing paper or unsaturated felt is placed on the bottom next to the roof boards, mainly to keep any pitch which might penetrate the two-ply felt above it from cementing the roofing to the sheathing. It also is of value in preventing the drying out of the roof through open joints from below. The saturated felts should be nailed where there is any chance of disturbance of the roof from underneath by wind, and also enough to hold it in place while laying. The practice in regard to nailing varies in different parts of the country, but the fewer nails the better, so long as the roof is held in place.

For a concrete roof the practcie is similar, except that a dry sheet is not necessary, there is no nailing and the concrete is first coated with pitch. Special care should be taken in regard to flashing and to prevent the roofing from being loosened at the edges either by wind or fire. Most leaks occur around flashings and openings.

The two layers of saturated felt first laid are necessary in order to carry and give full value to the amount of pitch which must be handled in one mopping. One of the troubles with built-up roofing as ordinarily laid is the difficulty in getting thorough moppings between the felt layers.

The felts are saturated with tar about as it comes from the gas house, with the water and other impurities removed. Oil-tar with its liquid qualities is said to be much used for this purpose. This is more permissible than it would be if the felt were to be exposed.

After the original two layers of saturated felt are used, the additional layers are merely to give additional thickness of wearing material, and with a roof properly laid, the greater the amount of felt and pitch used, the greater the life of the roof. Ten-ply roofs have been laid. If too much pitch on top is used, it will run.

The pitch, much stiffer than tar, is made by distilling off the lighter oils and part of the creosote oils from the tar. The melting point of the pitch, a very important matter, depends upon the point to which the distillation is carried, and the amount of free carbon. This should be varied somewhat to suit climatic conditions. Pitch for use in the fall in Winnipeg would be very difficult to work in New Orleans in the summer. The melting point of the pitch is not definite and in defining it a special specification is necessary. The use of a pitch with a melting point too high to allow satisfactory working and requiring the addition of fluxes on the work, giving a "cutback" pitch, is very liable to give uncertain results, and should not be allowed. Worse than this is the use of tar or soft pitch stiffened by the use of land plaster, Portland cement or similar materials. This not only is uncertain in its results, but it gives a product liable to have short life. The best practice allows the use of nothing but straight run pitch.

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* Extract from the report of the Committee on Buildings of the American Railway Engineering and Maintenance of Way Association.

The coating of gravel, crushed stone or slap, helps to hold the pitch in place, protects it from wear and from the action of the elements, and has considerable fire retardent value. If the material be too fine its holding power is lessened. If it be too large the stones are more apt to roll off and to damage the roof when it is walked upon, and the pitch is not properly protected. Crushed material, with its rough, sharp edges, has a much better holding power than rounded gravel. It can be used to help get results on a steep roof. Sand or dirt with the gravel is objectionable, as it tends to prevent the gravel from bedding in the pitch, and sometimes it mixes with the pitch, the resultant being more inert and liable to crack than the clean pitch.

In the final coating of a coal tar roof the effort is to get the maximum amount of pitch coating which can be kept in place. The flatter the roof the greater amount of pitch that can be used and the better both pitch and gravel will stay where put. The best results are obtained when the slope of the roof is only enough to allow it to thoroughly drain. When it gets above two inches to the foot many object to its use, but the above specifications are considered by others as good practice up to three inches to the foot. Above that amount a built-up coal-tar roof, using these specifications, is of doubtful economy on permanent buildings, though fairly good results have been obtained from roofs steeper than this without special precautions. One method which gives good results is the addition of some asphalt to the pitch which is used for the top coating. This must be carefully done, as an intimate mixture of the asphalt and tar pitch is not easily obtained. The tar is often prepared for use on steep slopes by the addition of some finely-ground inert material which, as previously stated, is liable to give uncertain results. Actinolite is preferred for this purpose by some of the best roofers. Portland cement and land plaster are used, but do not do as well, having chemical action on the other materials. Pitches prepared in this manner are perhaps to be preferred to stiff straight-run or asphalt pitches where skilled workmen are not available, as with the latter more skill is required in application. Slag is better than rounded gravel for steep roofs.

Where thorough inspection is not provided during construction the roof can be inspected by cutting a strip three feet long at right angles with the way the felt is laid before the gravel is applied. This can be readily repaired so that no damage is done to the roof.

When a built-up roof is in need of repair it can frequently be kept tight for a considerable time by patching and re-coating, as may be necessary, with pitch and gravel. When the original roof was well laid it can be repaired by scraping off the coating of gravel and laying a new two or three-ply roof on top.

Tile or brick can be substituted for the gravel or slag where the roof is liable to have much wear and when the structure warrants the expense. The tile are sometimes grouted in Portland cement, but a bituminous cement is usually considered better. Properly built this makes an almost ideal roof.

The built-up coal-tar roofs have shown by many years' trial their value for protecting flat roofs. Instances where a life of from twenty to thirty years has been obtained are not at all rare, but poor results due to poor workmanship and poor materials are not new. The claim that at the present time the ordinary purchaser cannot be sure of getting coal-tar of the quality of the best of that formerly produced would seem to have justification. At the same time, the oil-tar may be no worse than the fluxes and residuals frequently used with competing materials. Pure coal-tar and coal-tar pitch are still made, and the dealers in roofing materials can, if they desire, furnish materials as good as any which have been sold in the past. Such materials, of course, are not the cheapest, and where competition is severe, the quality is liable to suffer. About all that can be done to get the desired results is to be willing to pay the price and trust to the dealers.

The chances for poor workmanship are many and the most thorough inspection is very desirable. The moppings between the felts can be slighted, the flashing and work around gutters and openings neglected, the materials may be adulterated on the work, and the quantities of pitch and gravel cut down. The cost of materials and the cost of laying for any job can be estimated within close limits, and no contracts should be let which will require a slighting of the work to avoid a loss.

As an indication of what can be done in territory adjacent to Chicago and St. Louis the following figures may be of interest. They show the actual costs on a roof of about five hundred squares laid according to the specifications given above. The work was 75 miles from the gravel supply and 175 miles from the headquarters of the contractor, who paid all freight and fare. This work was done close to a railroad track, so that nothing was necessary for hauling to the work. Nothing is included for overhead or fixed charges or for profit.

Cost per square:

5 lbs. sheathing paper	$ .12
155 lbs. pitch at 60c. per cwt.	.93
85 lbs. felt to square at $1.40 per cwt.	1.19
Nails and caps	.05
Cleats for flashing	.05
Gravel (about one-seventh of a yard)	.23
Labor, including hauling, board and railroad fare	1.15
Total	$3.72

Where, for temporary buildings or other causes, a cheaper roof than the standard specifications call for is desired, a saving in the quantities of material can be made by reducing the number of plies. From this fair results can be obtained.

Plastic Roofing.—This is a sort of built-up roof used especially on steep slopes, where in place of using ordinary roofing pitch we have a compound of some fine inert substance with tar or some other bituminous material which is plastic when warm and which can be applied with a trowel. It is not extensively used and its application is mainly confined to the eastern part of the country. Except for steep slopes it has little value, as it lacks elasticity and because it requires considerable skill to get the proper proportions.

Built-up Asphalt Roofing.—Built-up asphalt roofs have been used with considerable success. Asphalt is much less affected by temperature changes. For a roofing cement it must have considerable proportions to flux to make it easy of application. Coal-tar felts are often used with asphalt roofing cements. With asphalt, the dry sheet can ordinarily be avoided. Where first-class material is used it is ordinarily expensive and it is harder to handle. Except for steeper slopes than are suitable for coal-tar, its use is not recommended unless unusual conditions make it more economical.

Asphalt coatings on a concrete deck are liable to lose their adhesion to the concrete, due possibly to destruction of the top surface of the concrete by acid in the asphalt flux. Asphalt used on a built-up roof is very liable to have a short life, and the builder of built-up roofs avoids it ordinarily.

Built-up Asbestos Roofing.—There is on the market materials for a built-up asbestos and asphalt roof. The asbestos, besides its well-known fire-resisting value, has the advantage that, being mineral, it will not decay. It is not as absorbent as felt and acts more as a protection to the bitumens than as a saturant. This roofing is ordinarily applied only by the manufacturers. The fire-resisting value of the asbestos is perhaps overrated and the wearing qualities of the top layers are questioned.

This roofing should have its best value on comparatively steep roofs. We are unable to express any opinion as to its value, but should judge that its expense is not justified for ordinary conditions.

PREPARED OR READY ROOFING.

To compete with it and to meet some of the conditions where a built-up roof is not satisfactory or too expensive, innumerable prepared or ready roofings have been put on the market. These ordinarily come in rolls accompanied by the nails and cement necessary to apply them. They vary from a very light felt with the cheapest possible saturant and enough sand or soapstone coating to prevent sticking in the rolls, to a sheet so heavy that it cannot be rolled, built up of heavy felts and strengthening materials and saturated and protected by carefully prepared compounds, possibly protected also by a coating of crushed stone. The durability and fire-resisting value vary to as great a degree. Ordinarily the ready roofings are cheaper than other types, but some brands sell at prices considerably above the cost of a good built-up roof. To a certain extent the weight is designated by the ply, but there is no uniformity of practice among the different manufacturers. A two-ply roofing may mean a heavier weight than a one-ply, or it may mean two separate felts stuck together.

The saturant should be liquid enough at workable temperatures to thoroughly impregnate the felt. The protective coating should be stable and not easily affected by the elements. The saturation of the felt is a very vital feature. This must retain its life and elasticity to keep the roofing efficient. A protective coating of material similar to the saturation is often used with the idea of helping to maintain the life of the saturating material. In any event, the coating must be elastic like the saturated felt.

With a coal-tar roofing made to be rolled, it is impossible to use nearly as much material as is found necessary for a good built-up roofing and such a roofing, even if made in the very best manner, cannot be expected to have a life comparable with that of a first-class built-up roof. Tar is not considered the best material for a high-grade ready roofing.

To successfully saturate with most asphalts a felt much more open than that necesary for coal-tar must be used. Asphalt must be heated to a much higher degree than ordinary coal-tar to successfuly saturate, and care must be taken to avoid charring the felt in the operation. Trinidad is but rarely, if at all, used for this purpose, it containing too much mineral matter and requiring too great a heat. California oil residuals are especially suitable for saturation purposes. At a temperature of 300 degrees Fahrenheit they are almost as limpid as water and at this temperature there would be no danger of charring the felt. They come between the so-called natural asphalts and coal-tar in their saturating properties and their susceptibility to changes in temperament.

The objections to asphaltic compounds for built-up roofings do not all apply for ready roofings made in the factory. Since the amount of material used is less, its cost is not of such great importance. None of the asphalts have all the desired qualities, and to produce certain results compounds of several different asphalts, residual pitches and fluxes are frequently used together. It is our understanding that Trinidad asphalt is seldom used as a protective coating, except in combination with other asphalts. Tar is sometimes used as a flux. Wax tailings, a residual obtained from petroleum in the manufacture of paraffine wax, and other similar substances, are common ingredients. Resin, which gives better saturating power to many asphalts, making the solution more liquid, is also used. It must not form too large a proportion of the total, as it tends to make the final product brittle. Stearine pitch is used in the coating for some of the smooth-surfaced roofings. It is an animal by-product obtained from stearic acid used in the manufacture of candles. It is said to be very stable and to be practically unaffected by the action of the sun. Some say that the amount claimed to be used in roofings is considerably greater than the total product.

The cement for use in laying, which is furnished with the roofing, ordinarily contains some naphtha or something similar, which serves as a drier.

Some ready roofings are adjusted by the manufacturer to suit the climate at the point of application. One concern selling all over the world keeps careful records of the temperature at its different markets and makes shipments accordingly.

The prepared roofings may be divided into two general classes—smooth and stone-surfaced. The stone-surfaced roofings are to a certain extent an adaptation of the built-up roofings. They frequently have at least two felts cemented together. The gravel or slag used must be uniform in size and finer than that available for a built-up roof. The steeper the roof the more chance they have to lose their stone coating. The amount of material that can be used in the heavier brands is limited to the amount that can be successfully rolled. If the stone be too large, the stone may damage the felt in rolling; if too small, the amount of pitch is limited.

The smooth-surfaced roofings are usually coated with some finely divided material to prevent sticking in the roll. Tar is not suitable for their protective coating, as it cannot easily be held in place in proper quantity without the stone coating. The protective coating must be stable and not easily affected by changes in temperature. Blown oils are frequently used for this purpose. The smooth-surfaced roofings, as a general proposition, have less insulating and fire-resisting value than the heavier stone surfaced materials. For the smooth-surfaced roofings a regular painting or recoating is usually necessary in order to get the best life.

Tarred felt, in which there are two or three plies of felts cemented together with pitch, are sold all ready to be laid. They must be covered with a tar coating upon laying and at frequent intervals to show any value at all.

The asbestos roofings are made to include one or more plies of asbestos felt, with possibly a jute center. They are cemented together by asphaltic cements. In the heavier brands they are expensive. The asbestos felts are poor saturants. These roofings have given promise of good results and are widely used. The asbestos will not burn, but the amount used is so small that its insulating value is not great, and the value of these roofings from the standpoint of fire protection is probably frequently over-estimated.

Burlap or jute canvas is used in ready roofings as a strengthening material. It is not a good saturant and must be kept thoroughly coated, as otherwise it goes to pieces readily. It is employed in conjunction with either felts or asbestos sheets. We question its value, feeling that better results can be obtained from a proper quantity of ordinary felt.

The ready roofing is weak in that with the narrow lap and a large part of the roof covered with but one layer of material a single defect can cause a leak. The fact that on a flat roof water is liable to back up under the upper layer is a chance for trouble. Care should be taken that a nail is not driven into a crack in the roof sheathing, as the nail will work out, leaving a hole in the felt for entrance of water. The exposed nailing, where it is used, may rust out and can cause a tear or leak around the nail hole. This exposed nailing is avoided in various ways. Some of the manufacturers of stone-surfaced roofings finish the upper part of the sheet, which is to be covered by the next sheet, without any stone coating. The next layer is cemented on this strip. The only nailing necessary is thus done on the covered strip, where it is covered up by the sheet above.

The use of tin caps under the head of nails to secure prepared roofing should be avoided. When used, they must be kept constantly coated, to prevent the rapid disintegration of the steel plates of which they are composed. If this ocurs the nail head stands clear of the roofing, which is then an easy prey to wind storms. Care should be taken in the flashing and around the edges of the roof to have it thoroughly fastened down. Nails of a No. 12 gauge wire with a cap made of cold-rolled hoop steel welded on in the factory are used for this purpose. Some recommend nailing every two inches, with with large-headed nails every three inches is usually considered enough.

One of the chances for trouble with many of the ready roofings is their tendency to stretch and wrinkle and the difficulty in laying them absolutely tight and flat. As the roofing grows older and brittle the wrinkles become danger spots, which are liable to crack if walked on. The roofing should be as thoroughly stretched as possible in laying. Knot holes should be covered before applying the roofing. In cold weather it is well to warm the rolls to avoid any chance of cracking.

To secure architectural effect on steep roofs a prepared roofing may be applied in various ways. For instance, by running the felt with the pitch of the roof, the joints and roofing nails can be covered with a molded batten of wood about ⅞ in. by 1½ in., the under side of which should be rabbeted out to a depth of an eighth of an inch to make room for the heads of the roofing nails. The recess or rabbet is filled with cement accompanying the roofing, and then securely nailed. This not only protects the nail heads driven to secure the roofing itself but adds stiffness and further protection against high winds getting under the seams and blowing off the entire covering. Roofs so prepared have the appearance of a standing seam tin roof, and the otherwise plainness of this roofing material is relieved. This adds to the cost by increasing the amount of waste as well as requiring the battens.

In order to avoid the single thickness and narrow lap the ready roofings can be used in various combinations. A two-ply tarred felt laid under a two-ply stone-surfaced roofing or two layers of smooth-surface roofing give what is practically a four-ply roof, not as good as a five-ply built-up roof in all details, but sometimes cheaper. A smooth-surface roofing is sometimes used under tile or slate and sometimes a prepared roofing is laid on top of old shingles.

The ready roofings usually commence to show deterioration after they have been kept in stock for three or four months. In purchasing care should be taken to avoid old material.

The ready roofings are of value for small and isolated buildings, where the cost of laying a built-up roof would be excessive, and for temporary structures, where a roof of long life is not necessary. They can be laid without the expert help required for a built-up roof, and most brands can be used on other slopes, although on flat slopes extra precaution must be taken to prevent leaking. They can be obtained at almost any desired price, but ordinarily cheaper than a good built-up coal-tar roof.

So many inferior roofings have been sold, so many have been poorly laid or used in the wrong places, so much has had to be learned by bitter experience, and there is such a chance for fraud that the ready roofings are shunned altogether by many builders who want good results. But experience is being gained gradually, and they will fill many needs so well that their use is bound to increase in their proper field.

Most of the ready roofings are sold under a five or ten years' guarantee, and many contracts for built-up roofs are similarly prepared. To depend upon these guarantees alone does not give satisfactory results even though the manufacturer be financially responsible. He can expect more immediate profit by preparing a roof which he is sure will last six or seven years, and selling it under a ten years' guarantee, than by preparing a roof which he is sure will last for ten years. At best the life will be uncertain, and with good luck a roof built for six or seven years or even less might last twice as long. If it should need extensive repairs before the guarantee runs out there is considerable chance that the manufacturer will not be called on to make the repairs, and if he is, the loss is not great. Guarantees are liable to be so worded as to afford various loopholes for avoiding expense, and they should, if relied on, be carefully scrutinized. A good roofing should last much longer than any possible guarantee can provide for. If the guarantee is made good, there still may be nothing left at its expiration.

New and untried brands are constantly being put on the market. In some of the older ones which have gained a reputation inferior products are substituted. Many of the best ready roofings are made of compounds whose composition is kept secret. The only way now of being fairly sure of good results is to use a brand which has been shown by long tests to meet the desired conditions, and which is made by a concern with a reputation for fair dealing. The same course would seem to be desirable in the awarding of contracts for built-up roofs, though with them track can be kept of the weight of material used, and the work on the roof can be inspected.

This is not a satisfactory condition, and as indicated in the earlier part of the report it is hoped that before many years specifications can be devised which, coupled with the necessary tests and with efficient factory inspection, such as that the Underwriters Laboratories is furnishing for some materials, which is explained below, will do away with the ignorance and fraud now enveloping the bituminous roofing industry. We should then be able to buy roofing with as much certainty of quality as we can now expect in ordering steel rail. To this end our Association, working in conjunction with other organizations, should do its part.

Stencil Decoration

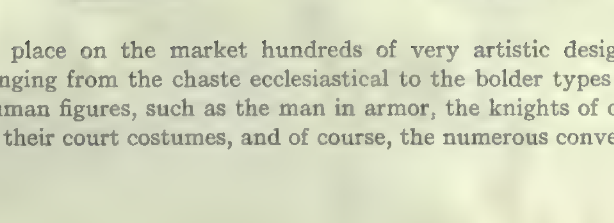
Its Adaptability to Wall Ornamentation

The history of decoration is simply one of development. In the life of all things there is a turning point which marks the degree of change. In regard to stencil work there are many kinds, in fact almost any material can be stenciled, but, generally, when we speak of stencil decoration we have in mind its relationship to wall surface.

Some fifteen or eighteen years ago stenciling and wall paper decoration seemed to go hand in hand. But, owing to a change in wall paper ideas, or fashions, stencils for home decoration seem to have dropped from use to a very great extent. There are many causes assigned for this. One of them is the introduction of blended wall paper, another is the low price at which we can obtain not only a large variety, but very artistic wall paper hangings.

Another difficulty experienced by those who would like to make use of stencil decoration was the finding of suitable patterns. There seemed to be such a very small variety to be had. that anything really artistic was used so frequently as to become an eyesore.

It is not every decorator who can sketch out a nice stencil pattern of his own design; therefore, those who could not do so had to make use of the limited supply that was to be had. But of late years the discovery of how to make use of materials has led to the introduction of water colors which seems to be again bringing stencils into use.



These discoveries have induced the promoters and others to place on the market hundreds of very artistic designs ranging from the chaste ecclesiastical to the bolder types of human figures, such as the man in armor, the knights of old in their court costumes, and of course, the numerous conventional designs. These can be used effectively in the decoration of public places.

Stencil Design from Decorator

The introduction of so many stencil designs is the means of bringing back into fashion the use of stencil work for household purposes, though it is hardly possible that stenciling will be used to the same extent in home decoration as in years gone by—that is in regard to its application on wall paper. As stencil work holds the place between the machine printed wall paper and the artists' freehand work, it was some years ago considered the proper thing to use in the re-touching of the wall paper pattern. It was claimed that it took away the mechanical appearances of machine printed paper.

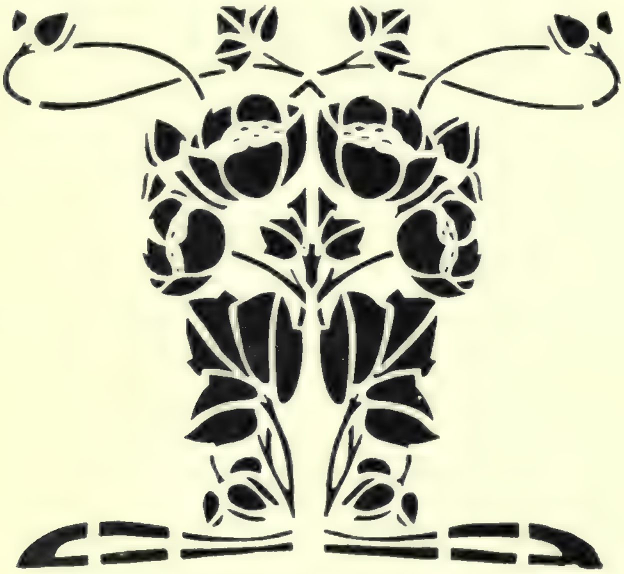
We all know that the man with the stencil brush cannot do such accurate work as the wall paper printing machine, but there are still a number who favor the use of the stencils particularly in the re-touching of friezes and foliage designs. They say it brings out the pattern better and does away with the flat appearance. This, like many other things, is purely a matter of opinion. We have reached such a very high standard in the manufacture of wall paper that it is difficult to improve upon it from an artistic standpoint.

But there seems to be another field that is mentioned before the use of stencil decoration in halls and other places. We all know that wall paper, no matter how artistic or how chaste in appearance, would not look well in a church or Sunday school. The devotees of stencil decoration have here a wide field to work in, but they should guard against the mistakes of the past. If a decorator is unable to design his own stencil plate he should ever be on the lookout for new stencil designs. By doing so he is sure to have a greater variety of patterns which will do away with the frequent use of the same old thing and add a charm to his work.

It has been said that there is nothing new under the sun and that we are merely searching with diligence the possibilities of decorative art in years gone by. It is true that the best works are those of men who have lived centuries back; we are merely adapting them or dressing them up to comply with modern ideas. Nevertheless the decorator who can sketch out a nice stencil, reflects in a certain degree his own personality.

Whether you design your own stencils or select them from the hundreds of patterns that are to be had in almost any fair-sized city, there are a few things that you must study. The principal one is the purpose for which you are to use the stencil. Be sure to select one in keeping with the nature of the place you are to decorate; don't use a design in a church that is bold, although it would be quite appropriate for a theatre or some such place. Of course, the same rule holds good in the decoration of places of amusement. Another thing—watch proportion. It is a quality which adds charm to everything. Use a large design to cover a large surface.

As there is a difference in the method of making a stencil plate between here and the old world I will outline the one generally followed by progressive decorators in America. Select a good tough manila or tag paper, give it a coat of boiled oil and see that it is thoroughly saturated. When dry, sketch out your design. In regard to the knife used in cutting out the pattern there is quite a difference of opinion. A pocket knife with a good strong handle that one can get a comfortable grip on and sharpened to a straight edge or with the point ground to an angle, makes about as good and serviceable a tool as a more expensive one. After you have cut out your pattern don't neglect giving it a coat of brown shellac, taking care that the shellac is not too thick, as this will stiffen the plate and cause it to crack.



Stencil Design Suitable for Frieze

There is another thing that must be kept in mind. The ties must be numerous so as to make the stencil strong. They should not run across broad spaced as they have got to be painted out afterwards, and this very often leaves a patched appearance, to say nothing of the loss of time in going over the design. Some prefer to use another color in filling up the gaps made by the ties, and if care as to harmony in the selection of another color is taken a very nice effect can be obtained.

The blending in stencil decoration is generally the one in which the most mistakes are made. Lack of judgment in the over-lapping often leads to what is known as a botched piece of work. A quarter of an inch is considered about the right margin. Of course the thickness or thinness of the color is a matter that must be given careful consideration. If your color is thick you will have to allow a greater margin and a better blend will be obtained by doing so.

A round or oval brush produces the best result. If you are using oil colors hold your brush at a right angle, if a water color, some have found the use of a fine sponge very effective as it produces an appearance very similar to ingrain paper. If you use a brush in water color don't apply it with the same force as when using it in oil; it will be streaky.

Another thing to keep in mind is the matching notch or key. See that your stencil is properly set, as the slightest mistake in this respect spoils the entire appearance of the work. A too full brush will very often cause an overflow of color which will run down under the stencil spoiling the work. work. A good plan to follow is to pour your liquid on a sheet of glass and feed your brush or sponge from it; by doing so you are sure to make no mistake in an over-supply.

Before proceeding to stencil a surface study out the space also the size of your stencil plate so that if the pattern is to go all round the room it will match perfectly. If your piece of work is one that has not to match at both ends, see that your design will finish at the ends in its entirety, thus avoiding a chopped off appearance so often found in otherwise good work. In conclusion, you must follow the dictates of Dame Fashion and there is a strong tendency on the part of the more progressive decorators to dispense with stencil work in connection with wall paper hanging These two decorative features have almost parted, at least for the time being. Each will reign in its own respective sphere, one in the home and the other in the decoration of halls and other public places.

Thirty Thousand Houses in Five Years

There are now no fewer than 91,160 houses in Montreal, as compared with 64,500 houses in 1906. The following table shows the number of residents that have come into the city by the new annexations:

Laurier Ward	8,200
Notre Dame de Grace	980
St. Paul	770
Emard	1,240
Bordeaux	310
Ahuntsic	200
Cote des Neiges	150
Longue Pointe	1,130
Rosemount	180
Total	13,160

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Editorial Notes

The BUILDER AND CONTRACTOR evidently had a field waiting for it, judging from the reception our subscription men are receiving.

* * *

In view of the increasing use of electricity throughout Canada, we have opened a new department for electric wiring. We shall be pleased to take up any phase of this subject or answer any questions pertaining to any part of the building trade problem.

* * *

Our article on "Framing by Use of the Steel Square" was so late in arriving this month that we have been obliged to omit it. We now have the series for three or four issues, so it will not occur again.

* * *

We publish several very valuable papers in this issue, especially R. E. Havlick's on concrete building blocks. This paper, delivered before the Canadian Cement and Concrete Association, last March, has been published earlier by some of our contemporaries, but, as we believe a very large percentage of our subscribers are vitally interested, we also reproduce it.

* * *

This year is going to be a record-breaker for building in Canada. The twenty per cent. increase of the first three months over the corresponding period last year will look small when compared with the second three.

* * *

Real estate dealers in London, Ont., report a steady demand for houses and state that there is great activity in sales. Many important transfers have taken place in the past few months, and a number of other deals are under way. This season will see a number of very fine new residences added to those already in the city. This is particularly the case in the north end, where several handsome homes are being built. There are a number also in South London, while in various places all through the city work is going on on new homes

* * *

What will be known as the Illinois Uniform Contract Document is about to be adopted generally by the architects and building contractors of Chicago. The matter of adopting a uniform contract has been under consideration for some time. A committee composed of thirty-three prominent architects and contractors representing various employers' associations in the building trades have been working in drafting this contract since last May. The provisions of the new building contract, it is understood, protect the interests of the contractor as well as that of the architect or owner. In other words, it gives the contractor a square deal, something he has not heretofore had under the average contract presented for his signature. The builders particularly will welcome the new uniform contract as the claim is freely made that they have received little or no protection under any of the old forms of contract which have all been in favor of the owner or architect. The new contract has already been ratified by the Architects' Business Association, the American Institute of Architects, the Western Society of Engineers, the Carpenters and Builders, the Masons and Contractors, the Cut Stone Men and the Architectural Iron League.

Asbestos Cement -A New Building Material

The Particular Points of Interest to the User are not so much "Where was it Invented?" as "How Does it Endure?"

The Asbestos-Cement Shingle, while not by any means a new production in the world sense, is quite new as a product of Canadian manufacture.

The particular points of interest historically to the user are not so much "Where was it invented?" as "How does it endure?" Fortunately the answer to the latter query is satisfactory from both the manufacturer's and the property owner's viewpoint. There is no question but that the Asbestos-Cement Shingle has "made good." They have been used in almost every country in the world with equal success, withstanding the hot torrid days and nights of the tropics as well as the cold and frosts of the Canadian winter.

Cottage Roofed with a 12 x 12 inch Asbestos-Cement Shingle.

They are appropriate for the finest residence when laid in designs to conform to the architectural lines of the house, and for industrial buildings in other shapes and sizes where cheapness and the fireproof features are paramount. A product which combines the fireproof, waterproof, and durable qualities inherent in the Asbestos-Cement Shingle can readily be seen to enjoy a wide field of usefulness.

In the first illustration is shown a stone cottage roofed with a 12 x 12 inch Asbestos-Cement Shingle, laid in the diagonal or French method, with ridges and hips finished with the asbestos roll. The roof is sheathed and papered as for a natural slate, after which the Asbestos-Cement Shingles are nailed with a special needle-point heavily galvanized nail, which is covered by the lap of the next shingle, and the lower corner then securely fastened with a copper storm nail. Special attention is called to the pitch of the porch roof, which is not great enough for either wood shingles or natural slate, as the former would rot with the moisture and the latter break at the nail holes with the frost, under these conditions. Neither moisture nor frost affects this material. There must, of necessity, be pitch enough to drain, in any lap joint work, but the range of safety is greater with the Asbestos-Cement Shingle than with any other material now in use.

If the French method is not suitable to the design, the American or straight laid method may be employed. Shingles 8 x 16 inches or 6 x 12 inches are laid 7 inches and 5 inches respectively to the weather, producing a straight line effect similar to regular slate or wood shingles.

The second photograph shows a row of houses with another style of shingle, also 12 x 12 inches in size, but with the lower corner cut and dropped down a short distance, giving a broken diagonal line and a quarter of an inch thickness for shadow. This appeals to many architects as a desirable feature. The effect is indeed pleasing, and the cost no greater than the regular French method.

An especial feature of interest in this group of houses is the finishing of the second story in the English half-timber effect with panels of asbestos building lumber, which latter is also a product of Canadian manufacture. These sheets are made in sizes 42 inches wide and 48 and 96 inches long, 1-8 to 5-8 inches in thickness. The 3-16 or 1-4-inch stock is generally used for this purpose. The sheets are laid over the regular wood sheathing, which has been covered by a waterproof paper, and nailed with finishing nails under the battens. The sheets may either be butted tight together and battens nailed on flat, or a small space may be left between the sheets and the battens rabbited to fit. It is seldom necessary to have horizontal joints, but if such necessity arises these should be flashed with copper extending back of the sheet and out over the sill of the batten.

The particular features of merit in connection with the use of this material is the absence of any cracking and the possibility of its application in the coldest weather. Stucco or plaster, as it is well known, cannot be applied in freezing weather, and many houses are delayed, often for long periods, with consequent loss and annoyance on this account.

English Half-Timber Effect with Panels of Asbestos Building Lumber.

Asbestos Building Lumber can be applied quickly and cheaply in any weather, and you are always sure of your "mixture."

Another use is a suggestion for Western Canada, the covering of elevators with 16 x 16-inch Asbestos-Cement Shingle. The fire protection is an important feature. Even with a fire starting on the inside of a structure of this kind one may be sure it will get no further. The Asbestos-Cement Shingles act like a wet blanket, and while protecting absolutely from the outside, do not allow a fire to spread from the inside. The shingles hang together, do not shale and break, nor are they wafted away to set other fires. We have seen sheets of red-hot corrugated steel wafted away in the air to spread further destruction, from a fire in just such a structure as this.

As was stated at the beginning of this brief sketch, the application of these materials are many and varied. The shingles have been used for roofs and sides of dwellings, roofs of churches, school houses, railroad stations, and public buildings of all kinds. The Asbestos Building Lumber has found a field of usefulness in replacing of stucco on residences, for wainscotting in bathrooms and kitchens, for ceilings with beamed timber effect in private residences, dining-rooms, interior of sun parlors, interior and exterior of garages, bungalows, and places too numerous to enumerate. It is quite true the material has "made good" and is to be numbered among the accepted standard building materials in this coming age of cement and permanent construction.

Blaugas for the Country Home

Herman Blau, a German inventor, recently perfected a gas for heating and illuminating purposes, one that has the advantages of city gas, and yet can be transported with the same facility as any commodity used in a country house. It can be used for light, heat, and power anywhere. In drawing-room, sitting-room, and dining-room, Blaugas used with inverted mantles will give a brilliant illumination and add immeasurably to the enjoyment of evenings in the country house. In den, library, and bedrooms, halls, and porches, it can be adopted to secure any kind of lighting effect desired. In the bath-room it will furnish hot water. In the kitchen it supplies the fuel for cooking and washing. In the outbuildings or grounds it is ready for use at any time for light, heat, or power.

Leaks in ordinary city gas, if undetected, are prolific of death by asphyxiation. The element or danger in ordinary gas is the presence of carbon monoxide. Blaugas is entirely free from this fatal gas, therefore it is non-poisonous. It also has the added advantage of being practically non-explosive, the reason being that Blaugas explosive range is three times narrower than city gas. Another great advantage, especially in this northern country, where the winters are, as a rule, long and rigorous, is that it will not freeze under any circumstances. Some of the advantages claimed for Blaugas, for the country house, are:

First: Is the safest illuminant known.

Second: Will not freeze or condense in the pipes.

Third: Produces three times as much heat per cubic foot as ordinary city gas.

Fourth: Requires only a small equipment, therefore the cost of installation is very low.

Fifth: Is easily installed.

Sixth: Needs practically no attention or care, merely the exchanging of empty bottles for full ones.

It is evident, therefore, that Blaugas brings to the country dweller all the illuminating and heating advantages enjoyed by the city resident, with many of the disadvantages eliminated.

The outfit is made in two sizes, Style A and Style B. Style A is contained in a steel case with a capacity for two bottles of gas, suitable to take care of a medium-sized house or store. Style B is similar to Style A, but of a larger capacity, suitable to take care of larger houses, stores, churches, etc. Equipments are sold for cash or on the instalment plan. Gas is supplied in steel bottles, by the pound, the bottles being loaned by the company. The company also sell fixtures and stoves.

If the house is properly piped for gas of any kind, no change is needed.

Book Notes

STANDARD HANDBOOK OF ESTIMATING DATA. Size, 3½ x 5¾ in. 80 pages. Bound in board covers. Published by the Builders' Auxiliary Company. Price, $1.00.

This little work is designed especially for the use of architects, contractors, estimators, carpenters, masons, plumbers, painters, electricians, tinsmiths, draftsmen, etc., the information being compiled from a large number of actual contracts of varying sizes under varying conditions The manner in which the information is arranged is, so far as the authors are aware, entirely different from anything previously published, and the figures presented are those for average work by average workmen.

In regard to the data on labor, the fact has been carefully kept in mind that what a workman actually does day after day is quite different from what he can do if pushed for a limited time under the most favorable conditions. All the figures given are made up from an average taken of work accomplished, including instances when conditions were unfavorable, favorable and just average.

No prices of work or material are given, as such could only be applicable for a limited time and over a limited area, but the data are so arranged that with a knowledge of local conditions the cost of any piece of work can be easily computed.

The little work in question has been brought out to meet the numerous requests received by the authors since publishing the Builders' Auxiliary reviewed in these columns a ing the Builders' Auxiliary to publish the data in that work regarding labor and material in the form of a small book of a size convenient to carry in the pocket, and therefore be of ready reference. The price is $1.00. The same company also publish THE BUILDER'S AUXILIARY, a series of three books comprising a "Material Book," a "Time Book," and an "Estimate and Cost Sheets Book." In these the minutest details of every job may be entered.

The only way for a builder to know if his business is profitable and where to discover the leaks, is by an accurate and detailed system of cost keeping, which keeps each department separate and yet works together as a whole.

It is rarely that any contractor completes a contract without finding he has omitted some item or other from his estimate, that afterwards was a source of greater or less expense to him. He who would profit by experience should invest in these books. The price is $5.00. They may be obtained through the publisher direct, or Dept. 1 K., The BUILDER AND CONTRACTOR.

The Builders' Note Book

Information Often Required by the Builder in Estimating and Designing*

CHARACTERISTICS OF TIMBER

This table must be used with caution as there is frequently wide variations in any timber.

Description	Tensile Strength per sq. in. in lbs.	Crushing Strength per sq. in. in lbs.	Relative Strength for Cross Breaking Whitepine equal 100	Shearing Strength with the Grain lbs. per sq. in.
Ash........	11,000 to 17,000	4,400 to 9,400	130 to 180	458 to 700
Beech.......	11,500 to 18,000	5,800 to 9,400	100 to 144	....
Cedar.......	10,300 to 11,400	5,600 to 6,000	55 to 63	....
Cherry......	....	....	130	....
Chestnut....	10,500	5,350 to 5,600	96 to 123	....
Elm.........	13,400 to 13,500	6,831 to 10,480	96	....
Hemlock....	8,700	5,700	88 to 95	....
Hickory.....	12,800 to 18,000	9,000	150 to 210	....
Locust.......	20,500 to 24,800	9,200 to 11,700	132 to 227	....
Maple	10,500 to 10,600	8,150	122 to 220	367 to 647
Oak, White...	10,250 to 19,500	4,700 to 9,500	130 to 177	752 to 956
Oak, Live....	....	6,850	155 to 189	....
Pine, White..	10,000 to 12,000	5,000 to 6,650	100	225 to 423
Pine, Yellow..	12,600 to 19,200	5,400 to 9,500	98 to 170	286 to 415
Spruce.......	10,000 to 19,500	5,050 to 7,850	86 to 110	253 to 374
Walnut, Blk..	9,286 to 16,000	7,500	....	....

LENGTH AND NUMBER OF CUT NAILS TO THE POUND

Size	Length	Common	Finishing	Fine	Casing	Brads	Cut Spikes
¾	¾ in.	...	....	....	....	....	...
⅞	⅞ in.	...	. .	.	.	.	..
2d.	1	800	1100	1000	..	.	
3d	1¼	480	720	760	...	. .	.
4d.	1½	288	523	368	398	. .	.
5d	1¾	200	410	....	....	. .	
6d.	2	168	268	. .	224	126	.
7d	2¼	124	188	..	....	98	..
8d.	2½	88	146		128	75	
9d.	2¾	70	130	..	110	65	..
10d.	3	58	102	...	91	55	28
12d.	3¼	44	76		71	40	...
16d	3½	34	62		54	27	22
20d.	4	23	54	.	40	...	14½
30d.	4½	18	....	.	33		12½
40d.	5	14	.	.	27	...	9½
50d.	5½	10		...	...		8
60d.	6	8		.	.	.	6
	6½	....		.		. .	5½
	7					...	4½
	8				...	.	2½

TABLE FOR ESTIMATING QUANTITY OF NAILS.

Work or Material	Size of Nail	Lbs. Required
1000 Shingles..................	4d	5
1000 Laths	3d	7
1000 Sq. Ft. Beveled Siding......	6d	18
1000 Sq. Ft. Sheathing...........	8d	20
1000 Sq. Ft. Sheathing...........	10d	25
1000 Sq. Ft. Flooring............	8d	30
1000 Sq. Ft. Flooring............	10d	40
1000 Sq. Ft. Studding............	10d	15
1000 Sq. Ft. Studding............	20d	5
1000 Sq. Ft. Furring, 1x2 in......	10d	10
1000 Sq. Ft. Fshd. Flooring, ⅞in.	8d to 10d Fin.	20
1000 Sq. Ft. Fshd. Flooring, 1⅛in.	10d Fin.	30

ROOFING SLATE.

Table of Sizes and Number of Slates in One Square (100 Square Feet) of Roof.

Size in Inches	No. of Slate in a Square	Size in Inches	No. of Slate in a Square	Size in Inches	No. of Slate in a Square	Size in Inches	No. of Slate in a Square
6x12	533	9x14	291	10x18	192	11x22	137
7x12	457	10x14	261	11x18	174	12x22	126
8x12	400	12x14	218	12x18	160	14x22	108
9x12	355	8x16	277	14x18	137	12x24	114
10x12	320	9x16	246	10x20	169	14x24	98
12x12	266	10x16	221	11x20	154	16x24	86
7x14	374	12x16	185	12x20	141	14x26	89
8x14	327	8x19	213	14x20	121	16x26	78

A square of slate is roughly estimated at from 600 to 700 pounds per square, varying according to the thickness of the different makes.

Weight Per Square Foot.

Thickness.....	⅛	⅜	¼	⅜	½	⅝	¾	1	
Weight........	1.81	2.71	3.62	5.43	7.25	9.06	10.87	14.5	lbs.

Weight per cubic foot, 174 pounds.

On account of laps, it takes an average of about 2½ square feet of slate to make one of slating.

PINE SHINGLES.

Number and Weight of Pine Shingles to Cover One Square (100 Square Feet) of Roof.

Table based on 4 inch width. For other widths multiply given number by 4 and divide by the width.

Number of inches exposed to weather.	4	4½	5	5½	6
Number of shingles per square of roof.	900	800	720	655	600
Weight in pounds of shingles on one square of roof....................	216	192	173	157	14

The number of shingles per square is for common gable roofs. For hip roofs add 5% to these figures. The weights per square are based on the number per square. Shingles come 250 to the bundle. 4-inch shingles weigh 240 pounds to 1,000.

SKYLIGHT GLASS.

The Weights of Various Sizes and Thicknesses of Fluted or Plate Glass Required For One Square (100 Square Feet) of Roof.

Dimensions in inches.	12x48	15x60	20x100	94x156
Thicknesses in inches.	3.⅙	¼	⅜	½
Area in square feet...	3.997	6.246	13.880	101.768
Weight in pounds per square of roof......	250	350	500	⅜ 700

No allowance is made for lap in above table.

Safe Loads on Masonry.

	Tons per sq. ft.
Kiln dried bricks, laid in mortar..................	8
Ordinary brick. laid in Portland cement............	5
Hard brick, laid in lime mortar.....................	6
Hard brick laid in Portland cement and lime mortar..	9
Hard brick, laid in Portland cement and mortar.....	12
Pressed brick, laid in lime mortar.................	8
Pressed brick, laid in Portland cement mortar.......	14
Rubble stonework in lime mortar...................	4
Rubble stonework in lime and cement mortar.......	6
Rubble stonework in Portland cement mortar.......	8
Concrete, one part cement, two parts sand and five parts stone..........................	15

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* Under this heading we shall be pleased to give any information about building materials desired by our readers.

Law and The Builder

Edited by Robert Wherry, B.A., LL.D., of Osgoode Hall, Barrister-at-Law.*

Quebec

In an action for work done in virtue of a contract, the defendant may legally plead as set-off the damages resulting to him by the inexecution of the same contract by the other party. R. & O. Nav. Co. v. Portbriand Co., Ltd., 11 Quebec, P.R. 98.

The lien of a person furnishing materials does not attach upon the property in which they became incorporated unless the essential condition of a notice served upon the owner before delivery, specifying the contracts of furnishing, the price of the materials, and the description of the property affected, is fulfilled. Judgment in Q.E. 33 S.C. 423 affirmed. Carriere v. Sigouin, Q. R. 18 K. B. 176.

1. Article 2013g, C.C., which obliges the material-man, for the preservation of his lien, to give notice of it to the owner of the property on which the materials are used, does not apply where the material-man deals directly with the owner of the property. 2. The material-man is not bound to give notice to one who, at the time of the delivery of the materials, had made to a third party a formal agreement for sale, before the completion of the work. 3. The material man who registers his lien must give notice of the registration to the owner of the property subject to the lien within three days of the registration, on pain of absolute nullity. Duncan v. Brunelle, 10 Q.P.R. 268.

A workman who causes his claim to be registered on the immovable on which his work is performed in order to secure a privilege or hypothec under Art 2013 (b) C.C., but neglects to bring suit within the delay prescribed in the article, is not bound to cause the registration to be cancelled at his expense. The owner of the immovable must put him in default (*en demeure*) to sign the discharge, attend to the cancelling, and pay the costs. Roy v. Gariepy (1909). Q.R. 36 S.C. 238.

A conveyance of property which is simulated and produces neither change of possession nor any other effect between the parties, whose sole object is to preserve the property from the attacks of the creditors of its owner is nonexistent as to them, and their action to have it so declared is not subject to the prescription for a year of art. 1040, C.C. 2. The registration of a deed is not a public act, and is inadmissible as proof that creditors of the parties had knowledge of it in the sense of art. 1040, C.C. Lemay v. Defresne, Q.R. 18 K.B. 132.

No liability for tort attaches where there is no fault, either actual or constructive. When an employee is ordered by his employer to perform work in the ordinary course of his employment, he assumes the ordinary risks inherent to it, and, if he meets with an injury, he must show, to be entitled to damages from his employer, that the latter caused it by some fault of commission or of omission. Demeule v Quebec and Jacques-Cartier Electric Co., Q.R. 32 S.C. 318.

A covenant in a contract of hire of labor that the employer shall not be liable for accidents to the employe from the use of a machine he is hired to operate, is lawful and not against public policy. 2. An employer is not liable for an accident to an employe caused by his failure to comply with the instructions given him for operating a dangerous machine. Conan v. Charest. Q.R. 32 S.C. 385.

An employer who orders a workman, a youth of nineteen, alone and unaided, to select and take out from among a number, certain iron plates six feet by two and of a quarter of an inch thickness, weighing from 100 to 114 lbs., without instructing him in the manner of handling them, is guilty of negligence and liable to damages for an injury thereby caused to the workman. Boucher v. La Compagnie Martineau, Q.R. 33 S.C. 515.

The employer owes a duty to his workmen not only to give the necessary orders for their protection, but further, especially in the case of young and inexperienced workmen, to see that his orders are obeyed. His neglect to do so renders him responsible for accidents which happen in consequence. Union Card and Paper Co. v. Hickman, Q.R. 17 K.B. 163.

A foreman who causes a heavy body to be canted by means of a crane, and orders the crane-cable to be attached for a rolling hitch to a headless spike projecting from the body, so that the cable must slip when the spike is raised to a certain angle, is guilty of negligence and makes his employer liable for an injury caused thereby to one of the workmen. 2. When the injury is aggravated by the negligence of the workman, and it is impossible to determine the proportion of the damage attributed thereto the finding of the trial judge will not be disturbed in appeal, if not excessive. Locomotive and Machine Co., of Montreal, v. Lemay dit Delorme, Q.R. 17 K.B. 328, 4 E.L.R. 354.

A person who undertakes by contract to build a bridge for a municipal corporation, to be completed and delivered at a stated date, under a penalty of $5.00 per diem for delay, is liable only for such delay as occurs through his own fault or negligence, and not for that caused by failure of the corporation to locate, through some proper officer, as agreed, the site of the abutments, or by their altering the work, during performance, and substituting iron railings for the wooden ones mentioned in the contract. Dupuis v. Parish of Laprairie, Q.R. 28 S.C. 196.

Where an injury to a workman caused by the use of a defective machine, happens in the course of work done under contract, with a sub-letting of the hand work and machine work, and executed under the direction of a servant of the owner, there is a common fault of the owner, the contractor, and the sub-contractor, which makes them severally responsible. Dominion Iron and Steel Co. v. Cook, Q.R. 14 K.B. 563.

The neglect of the owner of a factory to furnish a dangerous machine with a guard as prescribed by the regulations made in virtue of art. 3022, R.S.Q., especially after notice to conform thereto given by an inspector of factories, is a fault which makes him responsible for accidents which result from the want of a guard. Belanger v. Desjardins Co. Q.R. 29 S.C. 1.

An employer who keeps his servant continuously at work for an undue number of hours makes himself liable for the result in damages of an accident to such servant in the ordinary discharge of his duty, caused by his inability from fatigue to use the skill and care required. 2. The father of the servant under age, in the above circumstances, has a right of action against the employer to recover his expense and loss of time in caring for his son, and the medical attendance for which he had made himself responsible, but not for loss resulting from the diminished earning capacity of his son in the future. Great Northern R. Co. v. Couture, Q.R. 14 K.B. 316.

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* Wherry & Balfour, Continental Life Building, Toronto.

Manitoba

In an action for damages for injuries sustained by the plaintiff while in the service of the defendants, owing to the negligence of the defendants, the plaintiff being confined to his claim at common law, because the action was brought too late to succeed under the Workmen's Compensation for Injuries Act, the facts were briefly as follows. The plaintiff was employed as a structural iron worker, working under a foreman, W., who was a skilled man, in whom the defendants had reason to place confidence. Another gang, in which R., also a skilled man, was in charge as foreman, built cement piers, and, after the piers had hardened, drilled holes in them, into which split anchor bolts were driven in such a manner that the bolts spread in the holes. Then R's gang filled up the holes with grouting, and, after the grouting was set so as to hold the bolts firmly, W's gang erected pillars upon the piers, fastening the bases of the pillars to these anchor bolts. In the case of one of these pillars the bolts had been driven and the cement put in at 5 o'clock in the afternoon of the day before that on which the plaintiff was injured; on the next day, about 2 in the afternoon, the pillar was erected and fastened to the bolts, and the plaintiff took his place on the top of the pillar to guide a beam, when the pillar fell, and he sustained the injury complained of. If there was any carelessness, it was that of either W. or R., or both. It was said that W. carelessly was in the habit of having the pillars erected and sending men to work on top of them before the cement around the bolts had hardened; there was some evidence that one of the defendants knew this. The evidence showed that cement, in the weather conditions proved, would harden in from 20 to 24 hours, and in this 21 hours was the period. The evidence did not show what the fault was which caused the fall of the pillar, and the trial judge was unable to make any finding as to that: Held, that the plaintiff had not satisfied the onus upon him of showing that the injury happened in consequence of the negligence of one or both of the foremen, of which the defendants were aware; and that there was no such evidence of a defective system established to the defendant's knowledge as would entitle the plaintiff to recover at common law. To render the master liable at common law, the injury complained of must have been directly caused by the carrying out of a defective system of performing the work, known to and sanctioned by the employer. Unless such defective system is brought home to the employer, the ordinary principles applicable to cases where one servant is injured by the negligence of another engaged in the same employment must be applied. Smith v. Baker (1891) A.C. 325, followed per Cameron, J.A., that the defendants exercised ordinary care and precaution in their operations, and were absolved from liability. Judgment of MacDonald, J., 11 W.L.R. 347, affirmed. Laurence v. Kelly (1910), 13 W.L.R. 209.

A carpenter in the service of the defendants was told by a foreman to do certain work, and in doing the work found it necessary to move a plank fixed above the floor of the workshop. Standing on the floor he could not quite reach the plank, and he therefore took a ladder which was in the shop and stood upon the lowests tep, which gave way, and he fell upon machinery and was injured. Held, in an action under the Workmen's Compensation Act that, there being some evidence that the ladder was the property of the defendants, it was to be inferred that it was there designedly and with the object of being used for these purposes for which a ladder might advantageously and ordinarily be used, and that it was part of the plant, buildings, or premises in connection with the work to be done, and that the plaintiff did nothing more in using it as he did than would commend itself to the judgment of ordinary men as being a prompt and practical method of carrying out the foreman's instructions, and there was evidence that the ladder was applied to a use impliedly authorized by the foreman. Held also from the evidence the conclusion might fairly be drawn that the foreman who gave the order was the one instructed with the duty of seeing that the ways, works, and plant were in proper condition. Held, also, that the jury's finding that the ladder was defective was amply sustained by the evidence. Held, therefore, that there was evidence of negligence to be submitted to the jury; Perdue, J.A., dissenting. Held, also, that a finding of the jury to the effect that the plaintiff was guilty of negligence to the extent that he might have used some other and safer method of reaching up to and shifting the plank, was not relevant to the issues, and should not stand in the way of a judgment for the plaintiff. Held, also, that the amount of damages assessed by the jury, $1,500, was not excessive, and the court should not interfere on the ground that the plaintiff's injury might have been less serious if he had followed the advice of a specialist. Per Perdue, J.A. The plaintiff himself adopted the method he took of shifting the plank, without direction from the foreman; he negligently adopted a dangerous method when a safer one was open to him; and there should be a non-suit. Higley v. Winnipeg (1910), 14 W.L.R. 549.

Ontario

Plaintiff agreed to remodel defendant's house "in a good and workmanlike manner, and according to the best skill and art." Held, that the performance of the work in this manner is a condition precedent, and, not having performed the contract, is not entitled to be paid. He cannot recover on a *quantum valebat,* for there is no evidence of a contract to pay on that basis. When the plaintiff claimed he had finished the work he withdrew, leaving defendants in possession. This is not a waiver by defendants. Cole v. Smith, 13 O.W.R. 774.

Markets

Prevailing Prices of Builders' Supplies.

February 24, 1911.

CEDAR POSTS

8 feet x 6 inch top		0 30
8 feet x 7 inch top		40
8 feet x 8 inch top		50

CORNICE MATERIAL

⅞ x 2 Crown and Bed Mold	per 100 ft.	1 25
⅛ x 4 Crown and Bed Mold	per 100 ft.	2 00
⅞ x 6 Crown and Bed Mold	per 100 ft.	3 00
⅞ x 1¼ Cove	per 100 ft.	1 00

FRAME MATERIAL

⅞ x 4¾ Pulley Stile	per 100 ft.$	1 75
1⅜ x 4¾ Hanging Stile	per 100 ft.	1 25
1¾ x 4 Hanging Stile	per 100 ft.	2 25
1⅜ x 6 Hanging Stile	per 100 ft.	3 50
⅞ x 3¼ Lining	per 100 ft.	1 10
½ x ⅞ Parting Stop		60
½ x 1⅜ Sash Stop		85
1¾ x 5¾ White Pine Sash Sill or Door Jamb		4 00
1¾ x 5¾ Red Pine		3 25
⅞ x 5¾ White Pine Door Jamb No. 1 and No. 2		2 00.–1 75
3 x 6 White Pine Sub Sill		6 50
4 x 6 White Pine Sub Sill		7 50
2 x 6 Oak Sill	per lineal ft.	09
2 x 8 Oak Sill	per lineal ft.	12
2 x10 Oak Sill	per lineal ft.	15

HEMLOCK NO. 1

2 x 4 to 2 x 12 x 10 ft.	per M. ft.	21 00
2 x 4 to 2 x 12 x 12 and 14 ft.	per M. ft.	19 00
2 x 4 to 2 x 12 x 16 ft.	per M. ft.	22 00
2 x 4 to 2 x 12 x 20 ft.	per M. ft.	26 00
4 x 4 to 10 x 10 to 16 ft.	per M. ft.	21 00
1 inch Sidings		18 00.–19 00
1 x 10 inch and 12 inch Stocks		22 00

HEMLOCK NO 2

$4.00 per M less than No. 1

⅞ x 2 Bond Strip and Strappings	per 100 ft.	40

Sizing Joist and Scantling, $1.00 per M. extra
Dressing, $1.50 per M. extra.

LATH

No. 1, No. 2, No. 3 White Pine, 4 ft.	$	4 75.–4 25.–3 50
No. 1, No. 2, No. 3 Red Pine		4 25.–3 75.–3 00
M. R. White Pine, 48 inch,–32 inch		4 50.–2 25

PINE, Red

2 x 4, 2 x 6 x 10 to 16 ft.	$	24 00
2 x 4, 2 x 6 x 18 ft.		25 00
2 x 8 x 10 to 14 ft.		26 00
2 x 8 x 16 ft.		25 00
2 x 10 x 10 to 14 ft.		28 00
2 x 12 x 10 to 14 ft.		31 00
4 x 4, 4 x 6, 6 x 6 x 6 x 10 to 16 ft.		28 00
6 x 8, 8 x 8 x 10 to 16 ft		20 00
1 x 10 inch Box		28 00
1 x 12 inch Box		30 00
1 inch Mill Cull Sidings		21 00
1 inch Mill Cull Stocks		24 00
⅞ x 2 Strapping and Grounds	per 100 ft.	50
2 x 2 Bridging, cut to lengths for 2 x 8 and 2 x 10 Joist, per 100 pieces		1 75

PINE DRESSED

1 x 6 No. 1 Shelving, D. 2 S.	$	35 00
1 x 8 No. 1 Shelving, D. 2 S.		36 00
1 x 10 No. 1 Shelving, D. 2 S.		40 00
1 x 12 No. 1 Shelving, D. 2 S.		45 00

No 2 or Sound Common, $5.00 per M. less in each case.

SASH AND FRAME

1⅜.–1¾ inch Sash, 2 or 4 lights, up to 3.0 x 5.6		1 00.–1 10
1⅜.–1¾ inch Sash, 2 or 4 lights, up to 4.0 x 6.0		1 25.–1 45
1¾.–1¾ inch Casements, Cellar or Fanlights, 1 to 3 lights, up to 3.0 x 2.6		50.–60
Box Frames, up to 3.0 x 6.0		2 75
Box Frames, up to 4.0 x 6.0		3 25
Door Frames, 2 x 6 Jambs and 2 x 6 Oak Sill, up to 3.6 x 7		3 75
Door Frames, with Transom 2 x 6, Jambs 2 x 6, Oak Sill		5 00
Cellar Frames, 2 x 6, Jambs and Sills		2 00
Casement Frames, 2 x 6 Jambs and Sills, up to 8 sq. ft.		2 25

SHINGLES

XXX B.C. Cedar,–Ontario Cedar	per M.$	3 50.–3 35
XX B.C. Cedar,–Ontario Cedar	per M.	3 35.–2 75

STAIR MATERIAL IN PINE

1⅛ x 10, 1⅜ x 10, treads, nosed, up to 16 ft.,	per lineal ft.$	0.05.–06
1⅛ x 12, 1⅜ x 12, treads, nosed, up to 16 ft.,	per lineal ft.	07.–08
1⅜ x 10, 1⅜ x 12, strings, D. 4 S., up to 16 ft.,	per lineal ft.	06.–08
⅞ x 7, ⅞ x 8, Risers	per 100 ft.$	2 50.–2 75
3 x 3, 3 x 4 Hand Rail	per lineal ft.	07.–08
⅞ x 2¾ String Cap	per lineal ft	02
1⅜ x 2¼ Nosing and Cove	per lineal ft.	03
⅜ x 1¾, ⅜ x 2½ String Mold	per 100 ft.	1 00.–1 25
⅜ x 1⅜ and 1¾ Filling	per 100 ft.	1 25
¼ x ⅞, 1⅜ and 1¾ Filling	per 100 ft.	1 00
⅜ x ⅞	per 100 ft.	1 00
⅞ x ⅞, ⅞ x 1⅜, ⅞ x 1¾, 1⅜ x 1⅜ Balusters, per hundred		0 80.–1 00.–1 25 –1 50
4 x 4 Turned Newells, ¼ cut up to 5 ft.		1 00
5 x 5 Turned Newells, ¼ cut up to 5 ft.		1 25
6 x 6 Turned Newells, ¼ cut up to 5 ft.		1 75

STAIR MATERIAL IN HARDWOOD

1⅜ x 10, 1⅜ x 10½ to 12 Birch or Maple, nosed and cut lengths	per lineal ft. $	16.–20
1⅜ x 10, 1⅜ x 10½ to 12 Oak and Ash, nosed and cut to lengths	per lineal ft.	22.–25
3 x 4 Oak and Ash Hand Rail, 1 or 2 members	per lineal ft.	15
3 x 4 Birch Hand Rail, 1 or 2 members.	per lineal ft.	12
3 x 4 ¼-Cut Oak Veneered Hand Rail	per lineal ft.	25
⅞ x 2¾ and 3¾ Oak and Ash String Cap,	per lineal ft.	03.–04
⅞ x 1⅜ Oak Baluster, D. 4 S.	per 100 ft.	1 50
⅞ x ⅞ Oak, Ash and Birch Balusters, D. 4 S.,	per 100 ft	1 00
⅝ x ⅞ Oak and Ash Cove	per 100 ft.	1 00
5 x 5, 6 x 6 Turned Birch Newells, up to 5 ft.		1 75.–1 75

PINE TRIM—WHITE

⅞ x 4 Casing, Clear, No. 1, No. 2	per 100 ft.$	2 50.–1 80.–1 50
⅞ x 5 Casing, Clear, No. 1, No. 2	per 100 ft.	3 00.–2 15.–1 75
⅞ x 8 Base ,Clear, No. 1, No. 2	per 100 ft.	5 00.–3 25.–2 90
⅞ x 10 Base, Clear, No. 1, No. 2	per 100 ft.	6 50.–4 25.–3 75
⅝ x ⅞ Quarter Round	per 100 ft.	60
⅝ x ⅞ Cove	per 100 ft.	70
⅞ x 6, ⅞ x 7, ⅞ x 8 Heads, No. 1	per 100 ft.	2 50.–3 00.–3 50
⅜ x ¾ and 1⅜ Neck Mold	per 100 ft.	80
1⅜ x 1¾, 1⅜ x 2¾, 1¾ x 2½ Hood Mold	per 100 ft.	2 00.–3 00.–3 50
1⅛ x 4, 1⅛ x 5 Base Blocks	per 100 ft.	3 00.–3 50
1⅛ x 3½, 1⅛ x 4½ Window Stool	per 100 ft.	2 75.–3 25

SPECIFICATIONS

Clear—Bright Sap, no defect.
No. 1—Fine dressing, clear and cut up, sound stained sap, no defect.
No. 2—Common Dressing.
Clear face Norway, priced same as No. 1
Dressing Norway, priced same as No 2.

ROOFING

⅞ Roofing (sound knotted common pine)	per M. ft.$	30 00
⅞ Roofing, Red Pine, Spruce	per M. ft.	24 00.–25 00
⅞ Roofing, Spruce, No. 3 and M. C. Pine	per M. ft.	22 00
⅞ Roofing, Hemlock	per M. ft.	21 00

FLOORING

1⅛ Pine flooring, face strip measure	per M. ft $	45 00
⅞ x 4 and 5 inch, No. 1, No. 2	per M. ft.	30 00.–27 00
⅞ x 4 and 5 inch, No. 1, No. 2 Red Pine	per M. ft.	28 00.–25 00
⅞ x 2½ and 3½ Georgia Pine, B. and Better	per M. ft.	45 00

SHEETING

⅞ x 4 to 6, No. 1 and No. 2, V. and B Pine	per M. ft.	35 00.–27 00
⅞ x 4 to 6, V. and B. Spruce	per M. ft.	27 00
⅞ x 2 to 3½ V. and B. Georgia Pine, B. and Better	per M. ft.	45 00
⅜ x 2½ to 3½ V. and B., Pine, Face strip measure	per M. ft.	
⅜ x 2½ to 3½ V. and B., Georgia Pine, Face strip measure	per M ft.	28

SIDING

⅞, No. 1 and No 2 Pine, Man	per M ft.$	35 00.–27 00
⅞, Spruce and Red Pine, Man	per M. ft.	27 00
No. 1 and No 2 Feather Edge	per M. ft.	28 00.–22 00

VERANDAH MATERIAL

3 x 6 Top rail,	per lineal ft $	0 10
3 x 5 Top rail,	per lineal ft	09
3 x 4 Top rail,	per lineal ft	06
2 x 6 Bottom rail,	per lineal ft.	05
2 x 5 Bottom rail	per lineal ft.	04½
2 x 4 Bottom rail	per lineal ft.	03
5–16 x 1⅜ Lattice Work,	per 100 ft.	60
5–16 x 1¾ Lattice Work,	per 100 ft.	75
⅞ x 1⅜ Balusters, D. 4 S.	per 100 ft.	1 00
⅞ x 1¾ Balusters, D. 4 S	per 100 ft.	1 10
2¾ x 2¾ Balusters, turned up to 2 ft.		15
3¾ x 3¾ Balusters, turned up to 2 ft.		25
1⅛ Bandsawn Balusters, finished, each		08
1⅜ Bandsawn Balusters, finished, each		09
1¾ Bandsawn Balusters, finished, each		12
5 x 5 Newells, turned tops, ¼ cut, up to 3.6 long, each		1 00
6 x 6 Newells, turned tops, ¼ cut, up to 3.6 long, each		1 25
5 x 5 Newells, turned tops, hearts in, up to 3 6 long, each		75
6 x 6 Newells, turned tops, hearts in, up to 3.6 long, each		90

Corrected May 10, 1911	Advertised on Page	St John	Montreal	Toronto	Winnipeg	Edmonton	Vancouver
CEMENT							
Bbl. lots in bags, refund on bags returned		$ 1 80	$ 1 45	$ 1 90	$ 2 00.-2 35		$ 2 45
Car lots F. O. B. Car		1 60	1 35.-1 40	1 70	F O B. Ft. Wm.		
3000 Bbl. lots				1 55	1 55		
Small lots 10 cts. to 15 cts. extra for delivery on job							
BRICK Per M.							
No 1 Dry Red Pressed		21 00	16 00	17 00	33 00		40 00
No. 2 Dry Red Pressed		20 00	25 00	14 00			
No. 1 Dry Buff Pressed		25 00	17 00	18 00	45 00		
No. 2 Dry Buff Pressed		24 00	16 00				
American Pressed			32 00-35 00				45 00
Red Stock, Inside			9 00	9 50			13 00
Red Stock, Facing			10 00	12 00	23 00		45 00
Grey or White Stock, Inside			8 00	9 50	11 00		
Grey or White Stock, Facing			17 00	11 00			55 00
Wire Cut for Foundations			10 00	11 00	45 00		
Porous Terra Cotta			14 00	30 00.-35 00	45 00		
Scotch and English Fire		23 00	20 00	32 50.—35 00			45 00
American Fire			20 00	28 00.-33 00			
No. 1 Enamelled		90 00	73 00		100 00		100 00
LIME, PLASTER, ETC.							
Lime del. per 200 lbs		Per bbl. 85	6 00				1 35
Lime, Del. per cwt		" Cask 1 40	0 40	0 38			
Lime. Del. per car lot, per ton, F.O.B. Cars		bbl. haired 1 60	8 00	7 60			
Hydrated Lime, per ton, Del.			13 00	10 60	12 00		25 00
Hard Wall Plaster, Sanded, del. Ton, Bags Extra			4 75	5 85	12 50		6 00
Hard Wall Plaster, Unsanded (Stucco)			13 75	8 50			
Plaster of Paris, per Bbl. of 300 lbs.			2 00	3 00	3 10		4 25
Sacket's Plaster Boards 19 sq. 32in. x 36in.							3 50
Hair per pound			0 04				
BUILDING AND ROOFING SUPPLIES							
Tar Paper, 7-oz., 10-oz., 16-oz., per cwt.		1 60	1 50	1 60.-1 80			3 25
Tar Sheathing, per roll of 400 sq. ft.		40	0 32		0 88		90
Dry Sheathing, No. 1 per roll of 400 sq. ft.		50	45				75
Tar Fibre (or Dry No. 1), No. 2, per roll of 400 sq. ft.		40	45	40	72		1 00
Dry Fiber No 2, per roll of 400 sq. ft.		28	26	30			
Ready Roofing, 2 ply, per roll of 100 sq. ft.		62	57	70	2 00		2 50
Ready Roofing, 3 ply, per roll of 100 sq. ft.		85	77	95	2 50		3 50
Roofing Tin Caps, per cwt.		6 00	7 00	7 00	7 00		7 25
Roofing Wire Nails per cwt		6 75	5 00	6 00	4 15		4 50
Roofing Cement in Bbls, 40 gals		5 50	5 00				%
Roofing Cement small lots per gal.		1 20	20				
Roofing Cement Bbls., per cwt.				80	3 25		
Coal Tar, per Bbl., 40 gals, crude		3 85	3 15	3 50	5 00		7 25
Coal Tar, refined				4 00			
Roofing Pitch, No. 1, per 100 lbs.		1 70	65	70	1 00		
Roofing Pitch, No. 2, per 100 lbs.			50	60			
ROOFING SLATES							
No. 1 Canadian 10 x 16 in., per square, F.O.B. Cars			8 00	$ 7 00			
Mottled Unfading 10 x 16 in., per square F.O.B. Cars			10 00—12 00	7 75			
Green Unfading 10 x 16 in., per square F.O.B. Cars			8 00.-10 00	7 75			
Red Unfading 10 x 16 in per square F.O.B. Cars			10 00—12 00	18 00			
SEWER PIPE							
Straight per ft. 4 inch		08	07	$ 08¾	$ 10½		12
6 inch		10	10	14	16½		21
9 inch		25	21	22¾	29		
Single Junction 4 inch		50		35	50		70
6 inch		72		56	70		1 20
9 inch		1 45		91	1 20		
Increasers and Reducers 6 inch			54	56	50		
9 inch			84	91	1 00		
P. & H. H. Traps 4 inch				75			
6 inch		1 10		1 02	1 63		
9 inch		1 80		2 27	3 25		
Bends 4 inch		4 00	23	26¼	35		50
6 inch		29	38	42	50		1 00
9 inch		50	84	68¼	1 05		
Weeping Tile 2½ inch		1 05		02½			
3 inch				02½			04
4 inch				03½			05
These prices are net, being 65% off list price. Car lots, 12% off							
STONE							
SELECTED RUBBLE—							
Per ton delivered			2 75	$ 2 75			
RUBBLE							
Per toise delivered				15 00			
Per ton delivered				1 65			
Per toise delivered over hill				16 00			
Per ton delivered over hill				1 75			
Per ton on car				1 30			
HEADS AND SILLS							
Per foot Rock Face and Sawn Sills				38			
Per foot Rock Face 4in Sawn Sills				35			
Per foot Rock Face Heads (Indiana)				60			
Per foot Rock Face Heads (Breer and Credit Valley)				50			
Per foot Sawn Heads				40			
Per foot Bay Window Heads				45			
Per foot Bay Window Sills				40			
Per foot Tooled Heads and Sills				57			
Per foot Washed and Tooled Heads and Sills			65	60			
PIER CAPS							
Each 16inx16inx4 in Rock Face				1 25			
Each 20inx20inx4 in Rock Face				1 75			
Each 16inx16inx4¼in Rock Face				1 50			
Each 20inx20inx5¼in Rock Face				2 00			
GRAY COURSING							
Per yard 3inx 9in delivered in small lots				2 50			
Per yard 9inx12in delivered in small lots				2 75			
Per yard 3inx12in in car lots delivered				2 25			
Crushed, per cu yd, del on job							2 75
Crushed, F.O.B. Cars, per ton			$ 90.-1 00	$ 1 30.-1 35			
Binder, F.O.B Cars, per ton			1 50	1 40			
Brown Coursing, per yd., Del.				3 25.-3 50			
Terra Cotta (Constructional British) per ft cu			1 50—2 00	1 20—2 20			

Corinthian Stone

is extensively used for Church Buildings, in trimmings for brick or stone work, it is without an equal. Special prices for any work where a large quantity of repetition occurs.

Ingersoll Methodist Church—Architects, Messrs. Taylor & Taylor, Brantford

A large quantity of Corinthian Stone was used in the remodelling of this church. Estimates given for all classes of work. Send plans or write to

The Corinthian Stone Co.

OFFICE AND WORKS:
G. T. R. JUNCTION, GUELPH, ONTARIO

CORRECTED MAY 10, 1911.

	Advertised on Page	St. John	Montreal	Toronto	Winnipeg	Edmonton	Vancouver
WAGE SCALE IN BUILDING TRADES—							
Stone Masons, per hour			$ 50	$ 52½	$ 60–65		
Bricklayers, per hour			50	52½	60–65		
Structural Iron Setters			33½	on strike 25–35			
Ornamental Iron Setters			25–30	30–35	55		
Plasterers, per hour			40	50			
Lathers, Iron, per day			44 4-5	3 50–4 00			
Lathers, Wood, per day				3 00–3 50	5c sq yd		
Hoisting Engineers			25	35	40–60		
Tile Setters, per hour			25	40	60		
Plumbers, per hour			30–35	42½	50		
Steamfitters, per hour			30–35	42½	50		
Carpenters, per hour			25–30	37½	40		
Stone Cutters, per hour			40	50	60		
Marble Setters, per hour			37½	35–40			
Marble Cutters, per hour			30	30–35	35		
Painters, per hour			22½–30	30	40		
Sheet Metal Workers, per hour			30	33	40		
Electricians, per hour			25–27½	30	40		
Roofers, per hour			25–30	30	40		
Cement Finishers, per hour			30–35	40	50		
Laborers and Hod Carriers, per hour			15–22	25–28	25		
Teams, per day				5 00	5 00–6 00		
Subject to change May 1st.							
HARDWARE							
Steel Channels per 100		3 25		2 75–3 00			
Expanded Metal, 10 gauge, per 100 feet		3 75		3 50			
LOCKS							
Inside Sets, Steel, Various Finishes			40–1 50	40–1 50			
Inside Sets, Solid Brass, Various Finishes			80–2 25	80–2 25			
Inside Sets, Pressed Glass, Various Finishes			1 85–2 20	1 85–2 20			
Inside Sets, Cut Glass, Various Finishes			2 00–3 00	2 00–3 00			
Front Door, Bit Key, Steel, (old style)			1 00–1 50	1 00–1 50			
Front Door, Bit Key, Steel, (new style)			2 60	2 60			
Front Door, Bit Key, Brass, (new style)			3 75–5 00	3 75–5 00			
Sash Lifts, Steel, per doz			15–25	15–25			
Sash Lifts, Brass per doz			55	55			
Sash Fasteners, Steel, per doz			50–80	50–80			
Sash Fasteners, Brass, per doz			3 25–4 20	3 25–4 20			
Casement Fasteners, Solid Brass, with "T" Heads			25–50	20–50			
Casement Fasteners, solid Brass, with "T" Heads and Pull Handles			35–60	35–60			
Casement Fasteners, Iron, Black or Bronze			10–25	10–25			
Extension Bolts, Mortised, Each			80–1 20	80–1 20			
Casement Adjusters, Brass, Each			25–60	25–60			
Cupboard Turns, Steel, Each			07–15	07–15			
Cupboard Turns, Brass, Each			20–38	20–38			
Door Checks, Interior, Each			3 65	3 65			
Floor Hinges, Double Swing, Each			1 50–1 70	1 50–1 70			
WINDOW GLASS							
UNITED INCHES		Star D.D.	Star D.D..	Star D.D.	Star D.D.		Star D.D.
10 to 25 ber 100 ft. Box		2 55–3 45	$2 81–3 74	$2 68–3 94	$		$4 60–5 75
26 to 40 per 100 ft. Box		2 75–3 75		2 93–4 26	5 50		4 80–6 70
41 to 50 per 100 ft. Box		3 20–4 05	3 53–4 72	3 21 4 73	6 50		5 15–7 50
51 to 60 per 100 ft. Box		3 50–4 35	3 74–5 10	3 38–5 36	6 50		5 50–8 25
61 to 70 per 100 ft. Box		3 95–4 85	4 00–5 53	3 63–6 15	8 50		5 75–8 65
71 to 80 per 100 ft. Box		5 30	4 42–5 95	3 94–6 93	9 50		6 10–9 60
81 to 85 per 100 ft. Box		5 75	5 02–6 67	4 41–7 88	10 50		7 00–1075
86 to 90 per 100 ft. Box		7 00	7 74	9 45	11 50		12 00
91 to 95 per 100 ft. Box		8 15	8 42	11 03	13 50		14 00
96 to 100 per 100 ft. Box		9 60	9 35	12 92	16 00		16 50
101 to 105 per 100 ft. Box				15 12	18 50		20 50
106 to 110 per 100 ft. Box				17 33	21 00		24 50
PUTTY							
Bulk, in casks, per cwt.		2 25	1 85	$ 3 00	$ 2 90		$ 3 60
Bladders, in bbls., per 100 lbs.		2 65	2 00	2 25–2 50	3 15		5 00
Bladders, in 100 lb. Cases		2 75	2 25	2 75	3 40		
PAINTS, ETC.							
WHITE LEAD							
Pure F.B.W. English, per 100 lbs				$ 7 25			
Pure Canadian, per 100 lbs			6 50	$ 6 75			
No. 1, per 100 lbs.			6 00	6 25			
VARNISHES							
In 5-gal lots., Per gal. net..							
No. 1 Brown Japan			1 10	1 10			
Elastic Oak			1 50–2 00	1 50 2 00			
Hard Oil Finish			1 50–2 00	1 50 2–00			
Light Oil Finish			1 75–2 25	1 75–2 25			
Damar			1 75–2 00	1 75–2 00			
Shellac, white			2 75–3 00	2 75–3 00			
Shellac, Orange			2 50–2 90	2 50–2 90			
Turpentine, Brown Japan			1 25–1 50	1 25–1 50			
Turpentine, Black Japan			1 10–1 20	1 10–1 20			
Turpentine, No. 1, Black Japan			85–90	85–90			
Pure Knotting Shellac			3 00	3 00			
GLUE							
Common			08–08½	08–08½			
French Metal			10–14	10–14			
White, Extra			18–22	18–22			
Gelatine			23–30	23–30			
SAND							
Water washed, on dock, per cu. yd	inside b'k oever			50			
Water washed, delivered, per cu. yd				90			

As incorrect markets are worse than none, we would appreciate notice of any errors in our columns.

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